NEPTUNE PE/DE

Nilfisk ALTO

Why Compromise

Service Manual

Jetwash Direct ltd

NEPTUNE PE-DE_en_Ver.1.0_October 2010

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Preface

This service manual contains detailed description of the main repair work on the Hot Water High Pressure Washer, NEPTUNE PE—DE.

If operating errors are evident, refer the customer to the operating instructions.

A fault in the cleaner can have several causes as described in the section on trouble-shooting.

Refer to the illustrated spare parts lists during repairs. They show the assembly position and the sequence in which the individual components should be assembled.

Repair manuals and TSB (Technical Service Bulletin) sheets should be available at the site where repairs are carried out.

It is not permitted to give them to third parties.

Use original **Nilfisk-ALTO** spare parts only.

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For your own safety

Before using the cleaner, always read the operating instructions and keep them readily available.

Repair work should be carried out by persons instructed and trained in repairing this product.

The high-pressure cleaner should only be used by authorized persons who have been instructed in its use.

Although extremely easy to operate, children should not be allowed to use the cleaner.

NEPTUNE PE			NEPTUNE 5-46PE	NEPTUNE 5-54PE
Motor	Motor Manufacturer and type		Honda GX 340	Honda GX 390
	Power	HK/RPM	9,5/3600	11,0/3600
	Fuel type		Petrol	Petrol
	CCM	Cm3	337	389
	Fuel tank capacity	Liter	6,1	6,1
	Motor RPM, adjusted	RPM	3550	3400
	Pulley size	mm	SPZ 55,4/1	SPZ 55,4/1
	Motor oil type		SAE 15/40	SAE 15/40
	Motor oil capacity	Liter	1,1	1,1
Pump	Type		NA5	NA5
	Pump pressure	bar	188	198
	Machine outlet pressure	bar	167	170
	Water Quantity, high pressure	l/min	12	13,5
	Water Quantity, low pressure	l/min	13,5	15
	Suction capacity (feeded)	meter	3	3
	Pump inlet temperature	°C	35-40	35-40
Heat exchanger	Fuel pressure	bar	12	10
	Fuel consumption dt = 45 °C	kg/h	3,9	3,9
	CO_2 content (min.)	%	10,5	10,5
	Soot rating		0	0
	Efficiency	%	92	92
	Onboard fuel tank	Litre	57	57
	Heater rating	kW	68	81
	Delta T @ working pressure	ºC	75	81
Generator	Type		t16W-75	t16W-75
	Effect	W	1000	1000
	RPM @ HP and Boiler	RPM	2825	2825
	PUlley Size		SPZ 63/1	SPZ 60/1
	Belt dimension Motor/Gen.		SPZ 670	SPZ 670
Dimensions and weight	Length	mm	970	970
	Width	mm	780	780
	Height	mm	1000	1000
	Weight	kg	208	208
Miscellaneous	Sound power level CE, Lwa	Db	105	105
	High-pressure hose DN8	m	15	15
	HP nozzle		0400	0450

NEPTUNE PE			NEPTUNE 7-61PE	NEPTUNE 5-85PE
Motor	Motor Manufacturer and type		Honda GX 390	Honda GX 630
	Power	HK/RPM	11,0/3600	20,8/3600
	Fuel type		Petrol	Petrol
	CCM	Cm3	389	670
	Fuel tank capacity	Liter	6,1	20 (External tank)
	Motor RPM, adjusted	RPM	3550	3340
	Pulley size	mm	SPZ 55,4/1	SPZ 80/4
	Motor oil type		SAE 15/40	SAE 15/40
	Motor oil capacity	Liter	1,1	1,9
Pump	Type		C3	NP5
	Pump pressure	bar	202	210
	Machine outlet pressure	bar	192	195
	Water Quantity, high pressure	l/min	16	20
	Water Quantity, low pressure	l/min	18	21,5
	Suction capacity (feeded)	meter	3	5
	Pump inlet temperature	°C	35-40	35-40
Heat exchanger	Fuel pressure	bar	11	12
	Fuel consumption dt = 45°C	kg/h	4,6	5,75
	CO_2 content (min.)	%	10,5	10,5
	Soot rating		0	0-1
	Efficiency	%	92	92
	Onboard fuel tank	Litre	57	57
	Heater rating	kW	87	111
	Delta T @ working pressure	ºC	70	70
Generator	Type		t16W-75	t16W-75
	Effect	W	1000	1000
	RPM @ HP and Boiler	RPM	2825	2825
	PUlley Size		SPZ 63/1	SPZ 60/1
	Belt dimension Motor/Gen.		SPZ 670	SPZ 670
Dimensions and weight	Length	mm	970	1130
	Width	mm	780	910
	Height	mm	1000	1050
	Weight	kg	210	260
Miscellaneous	Sound power level CE,Lwa	Db	105	106
	High-pressure hose DN8	m	15	15
	HP nozzle		0500	0650

NEPTUNE PE			NEPTUNE 5-51DE	NEPTUNE 7-66DE
Motor	Motor Manufacturer and type		Yanmar	Ruggerini
	Power	HK/RPM	10/3600	16/3500
	Fuel type		Diesel	Diesel
	CCM	Cm3	406	-
	Fuel tank capacity	Liter	5,5	20 (External tank)
	Motor RPM, adjusted	RPM	3530	3500
	Pulley size	mm	SPZ 80/3	-
	Motor oil type		SAE 15/40	SAE 15/40
	Motor oil capacity	Liter	1,65	1,8
Pump	Type		NP5	C3
	Pump pressure	bar	185	185
	Machine outlet pressure	bar	176	170
	Water Quantity, high pressure	l/min	13,5	18,7
	Water Quantity, low pressure	l/min	15	20
	Suction capacity (feeded)	meter	3	5
	Pump inlet temperature	°C	35-40	35-40
Heat exchanger	Fuel pressure	bar	10	12
	Fuel consumption dt = 45°C	kg/h	3,9	4,85
	CO_2 content (min.)	%	10,5	10,5
	Soot rating		0	0-1
	Efficiency	%	92	92
	Onboard fuel tank	Litre	57	57
	Heater rating	kW	81	111
	Delta T @ working pressure	ºC	81	76
Generator	Type		t16W-75	t16W-75
	Effect	W	1000	1000
	RPM @ HP and Boiler	RPM	2825	2825
	PUlley Size		SPZ 63/1	SPZ 60/1
	Belt dimension Motor/Gen.		SPZ 670	SPZ 670
Dimensions and weight	Length	mm	970	1130
	Width	mm	780	910
	Height	mm	1000	1050
	Weight	kg	220	315
Miscellaneous	Sound power level CE, Lwa	Db	110	112
	High-pressure hose DN8	m	15	15
	HP nozzle		0450	0650

NEPTUNE PE			NEPTUNE 7-72DE
Motor	Motor Manufacturer and type		Mitsubishi
	Power	HK/RPM	16/1630
	Fuel type		Diesel
	CCM	Cm3	1318
	Fuel tank capacity	Liter	20 (External tank)
	Motor RPM, adjusted	RPM	1600
	Pulley size	mm	-
	Motor oil type		SAE 15/40
	Motor oil capacity	Liter	4,2
Pump	Type		C3
	Pump pressure	bar	200
	Machine outlet pressure	bar	185
	Water Quantity, high pressure	l/min	19,5
	Water Quantity, low pressure	l/min	21,5
	Suction capacity (feeded)	meter	5
	Pump inlet temperature	°C	35-40
Heat exchanger	Fuel pressure	bar	12
	Fuel consumption dt = 45°C	kg/h	5
	CO_2 content (min.)	%	10,5
	Soot rating		0-1
	Efficiency	%	92
	Onboard fuel tank	Litre	57
	Heater rating	kW	111
	Delta T @ working pressure	ºC	76
Genarator	Type		t16W-75
	Effect	W	1000
	RPM @ HP and Boiler	RPM	2825
	PUlley Size		SPZ 63/1
	Belt dimension Motor/Gen.		SPZ 670
Dimensions and weight	Length	mm	1130
	Width	mm	910
	Height	mm	1050
	Weight	kg	510
Miscellaneous	Sound power level CE, Lwa	dB	99
	High-pressure hose DN10	m	15
	HP nozzle		0640

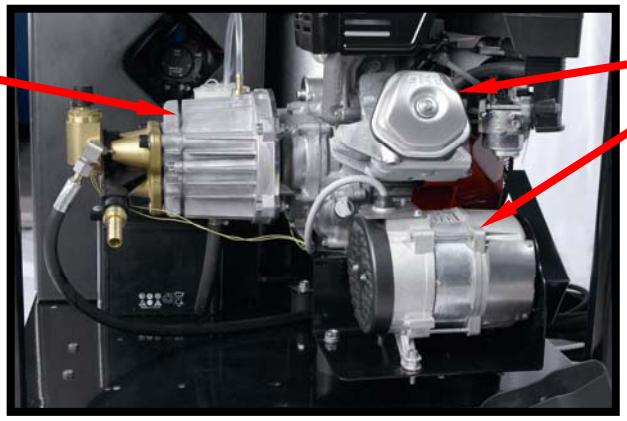
Overview NEPTUNE 5-46PE and 5-54PE

The NEPTUNE 5-46PE is designed with a NA5 high pressure pump, a NEPTUNE 5 boiler and a HONDA GX340 motor.
5-54PE has a Honda GX390 motor

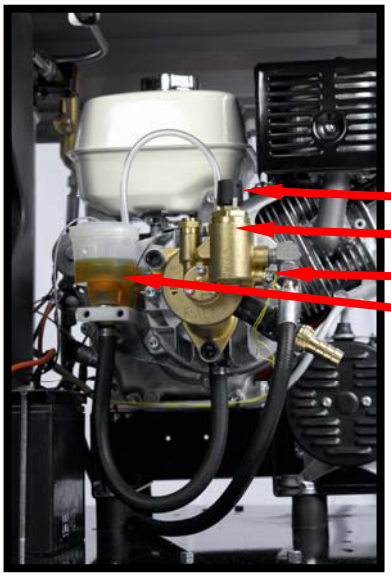
A small special hexagon key for easy adjustment of the fuel pressure is placed in the electric box in all NEPTUNE PE/ DE machines

Fuel pump access through the square hole on the right side of the fuel tank.

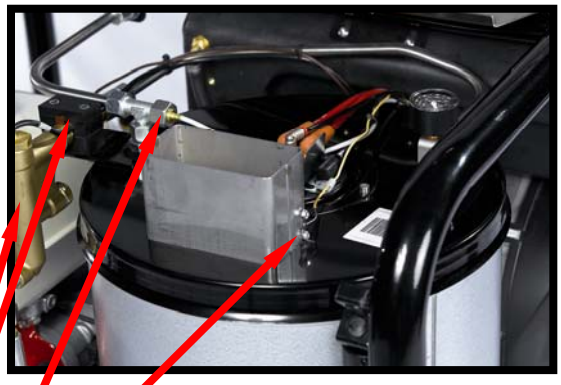
NA5 pump



Honda motor
230V Generator



Water regulation—pump
By-Pass valve
Temperature sensor—pump
Oil container w/ oil level switch



Temperature sensor exhaust

Temperature sensor water outlet

Flow switch 1 and 2

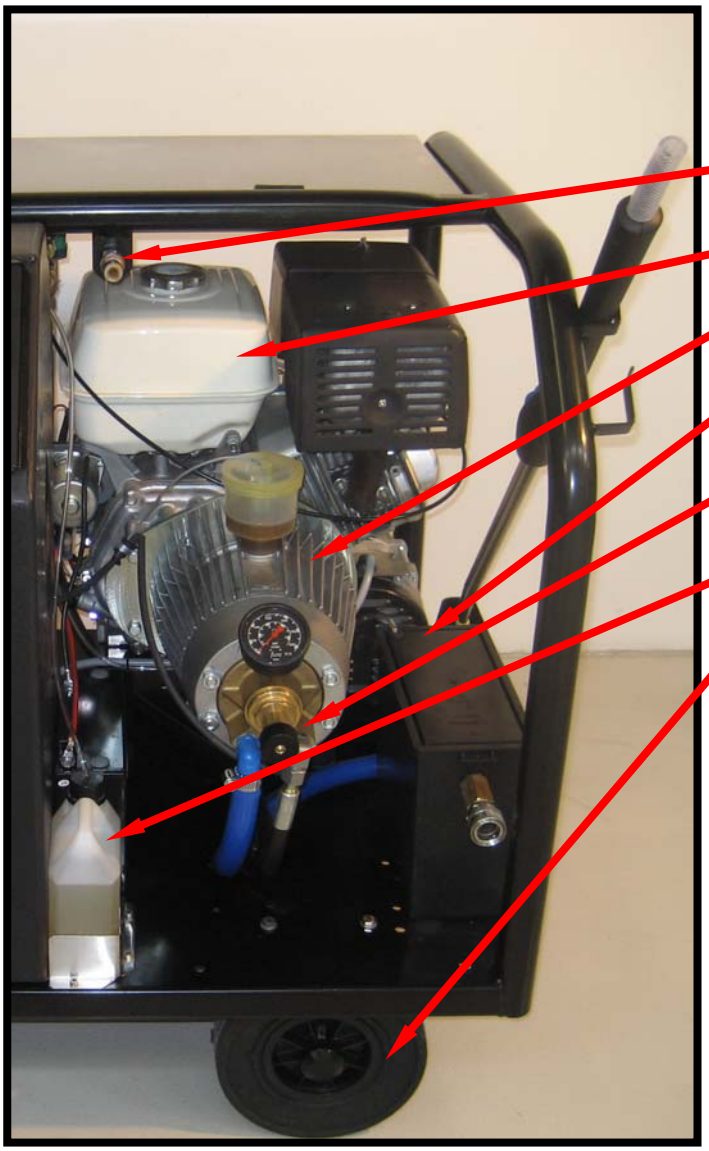
Overview NEPTUNE 7-61PE

NEPTUNE 7-61PE, front side

The NEPTUNE 7-,61PE is designed with a C3 high pressure pump, a Honda GX390 motor with 13 HP, control system same as on the NEPTUNE 3, and a NEPTUNE 5 boiler

A small special hexagon key for easy adjustment of the fuel pressu-re is placed in the electric box in all NEPTUNE PE/ DE machines

Fuel pump access through the square hole in the fuel tank.



NEPTUNE 7-61PE, front side

Water outlet

Honda Motor

C3 pump

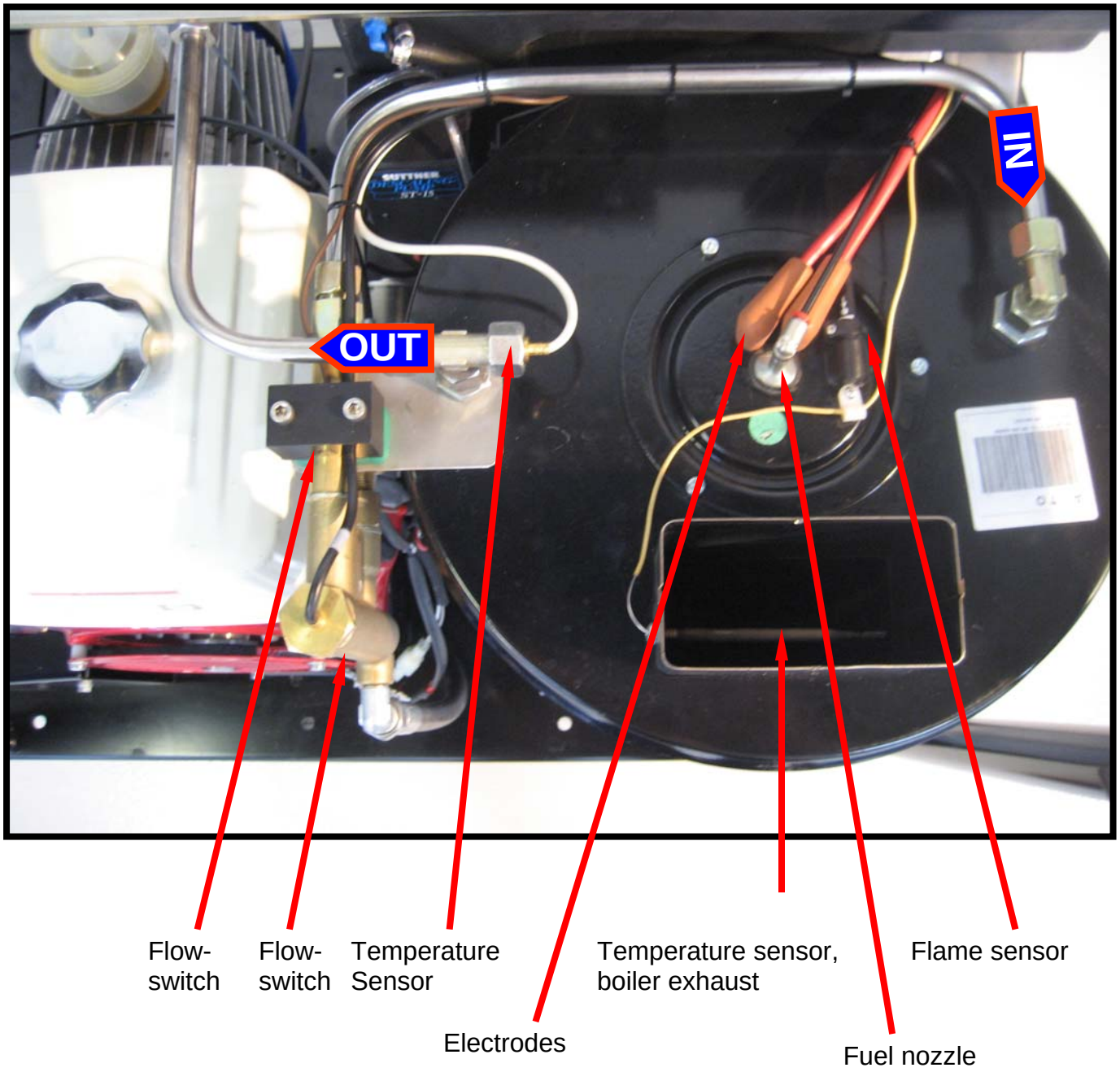
Water Break tank, OPTIONAL

Water regulator

Anti Scale container, OPTIONAL

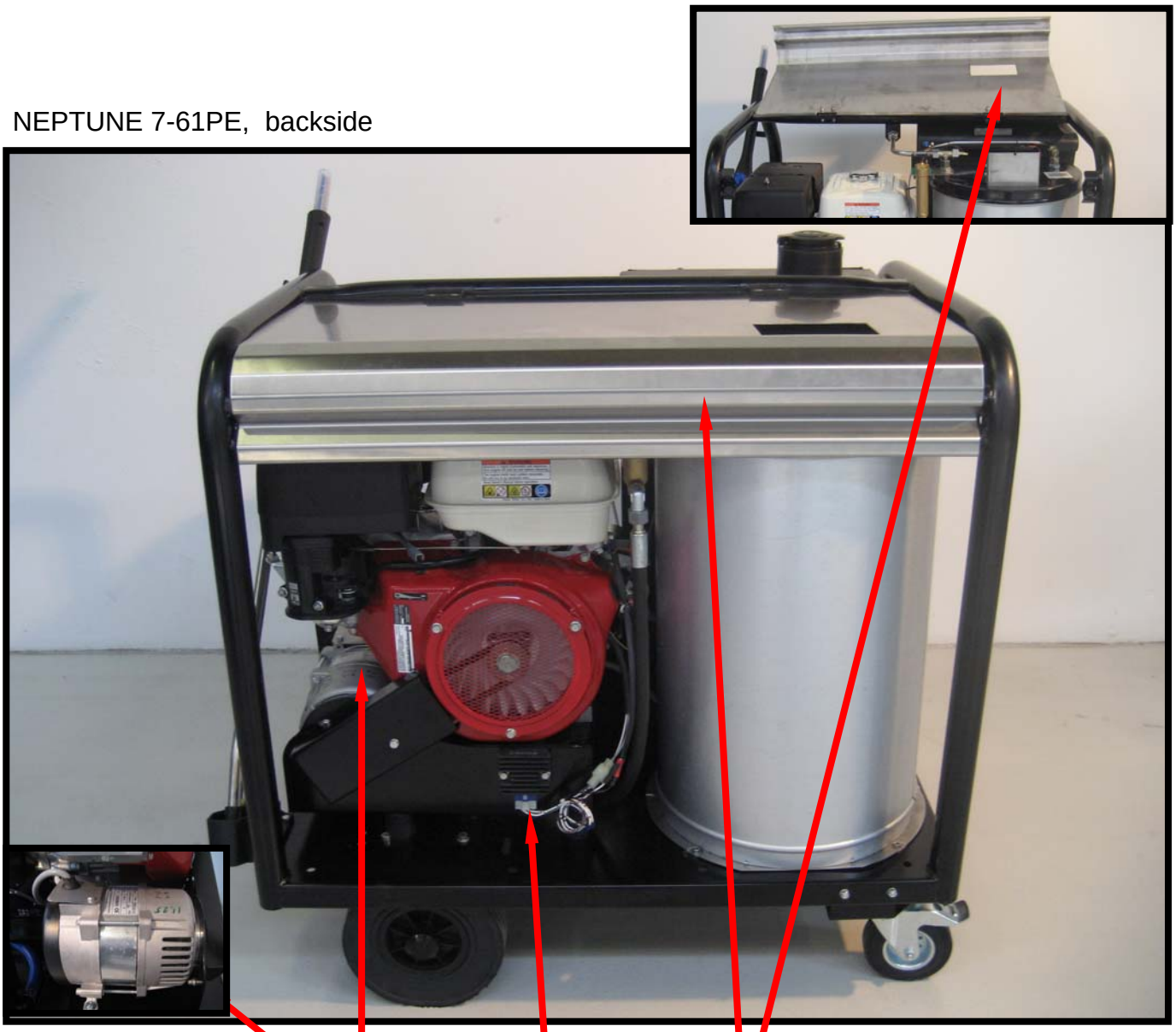
Wheels, OPTIONAL

NEPTUNE 7-61PE, boiler top



Overview NEPTUNE 7-61PE

NEPTUNE 7-61PE, backside



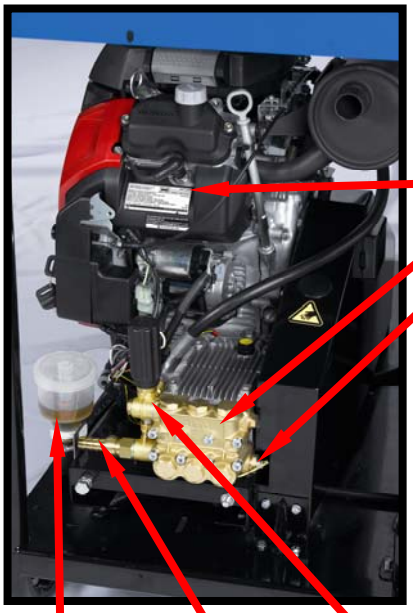
Generator, 230V Charging relay Top cover

Overview NEPTUNE 5-85PE

The NEPTUNE 5-85PE is designed with a NP5 high pressure pump, a Honda GX630 motor with 20 HP, control system same as on the NEPTUNE 3, and a NEPTUNE 7 boiler

Fuel pump access through the square hole on the right side of the fuel tank.

A small special hexagon key for easy adjustment of the fuel pressu-re is placed in the electric box in all NEPTUNE PE/ DE machines



Honda motor
NP5 pump
Temperature sensor—pump

Oil glass w/level switch

Water inlet

Unloa-der

Safety valve.

(This safety valve is used only on 5-85PE and 5-51DE, becasue the unloader does not have a safety valve).

Generator

Battery—12V

Overview NEPTUNE 5-51DE

The NEPTUNE 5-51DE is designed with a NP5 high pressure pump, a Yanmar motor with 10 HP, control system same as on the NEPTUNE 3, and a NEPTUNE 5 boiler.

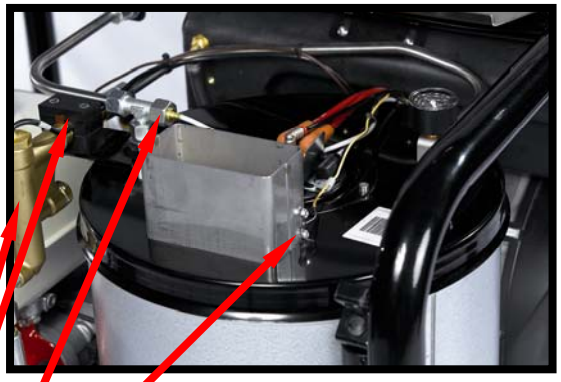
Battery 12V

Generator 230V

Yanmar motor

Fuel pump access through the square hole on the right side of the fuel tank.

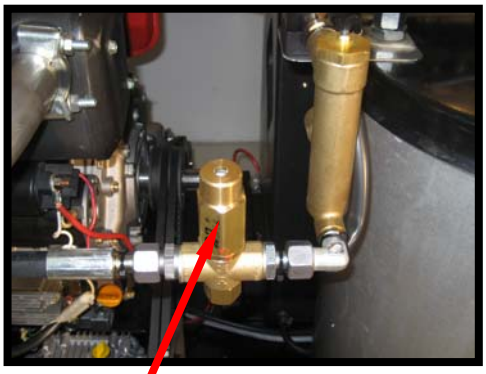
A small special hexagon key for easy adjustment of the fuel pressu-re is placed in the electric box in all NEPTUNE PE/ DE machines



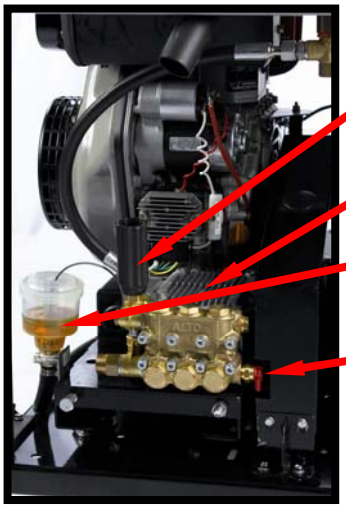
Temperature sensor exhaust

Temperature sensor water outlet

Flow switch 1 and 2



Safety valve (only on 5-51DE & 5-85DE)



Unloader & water regulator

NP5 pump

Oil container w/level switch

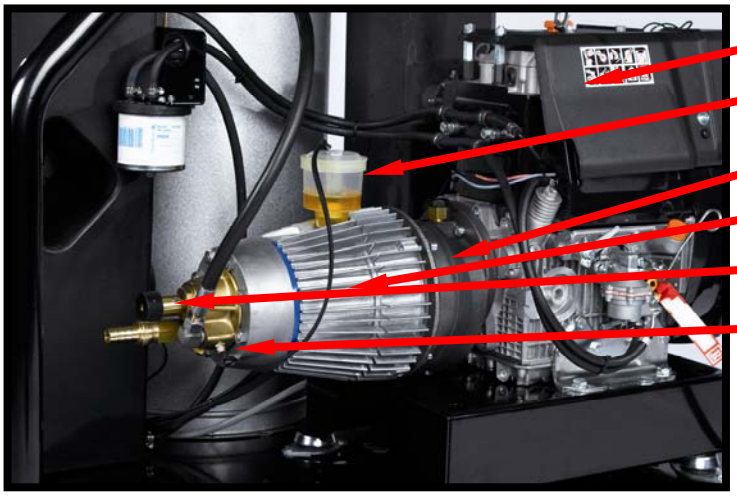
Thermal dump valve

Overview NEPTUNE 7-66DE

The NEPTUNE 7-66DE is designed with a C3 high pressure pump, a Ruggerini motor with 16 HP, control system same as on the NEPTUNE 3, and a NEPTUNE 7 boiler.

Fuel pump access through the square hole on the right side of the fuel tank.

A small special hexagon key for easy adjustment of the fuel pressu-re is placed in the electric box in all NEPTUNE PE/ DE machines



Rugerinni motor

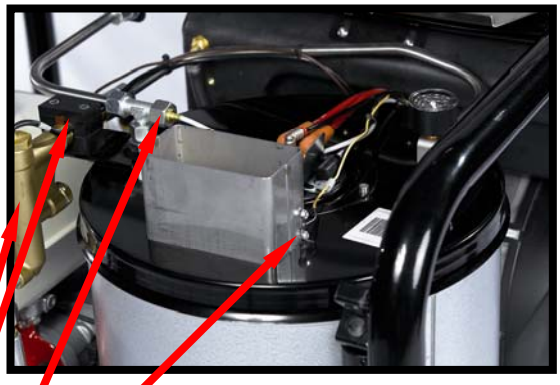
Oil container w/level sensor

Gera box between motor and pump

C3 pump

By-pass valve W/water regulator

Temperature sensor—pump



Temperature sensor exhaust

Temperature sensor water outlet

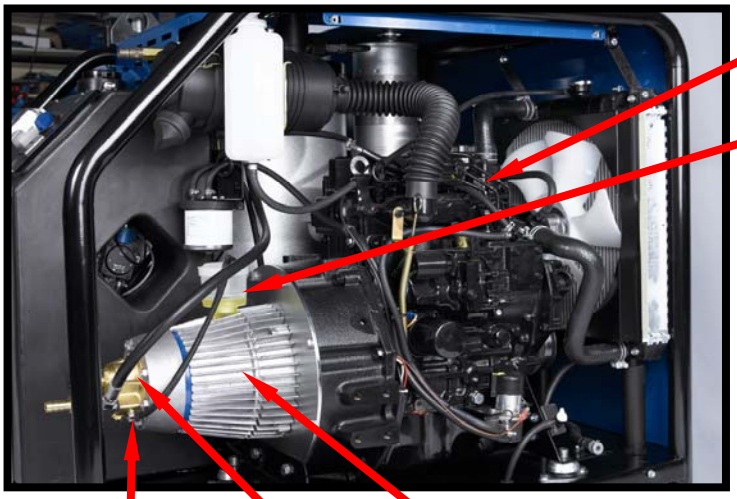
Flow switch 1 and 2

Overview NEPTUNE 7-72DE

The NEPTUNE 7-72DE is designed with a C3 high pressure pump, a Mitsubishi motor with 15 HP, control system same as on the NEPTUNE 3, and a NEPTUNE 7 boiler.

Fuel pump access through the square hole on the right side of the fuel tank.

A small special hexagon key for easy adjustment of the fuel pressure is placed in the electric box in all NEPTUNE PE/DE machines



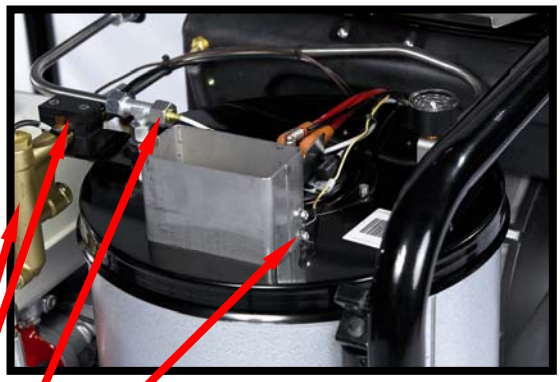
Mitsubishi motor

Oil container w/level sensor

Temperature sensor—pump

By-pass valve w/ water regulator

C3 pump

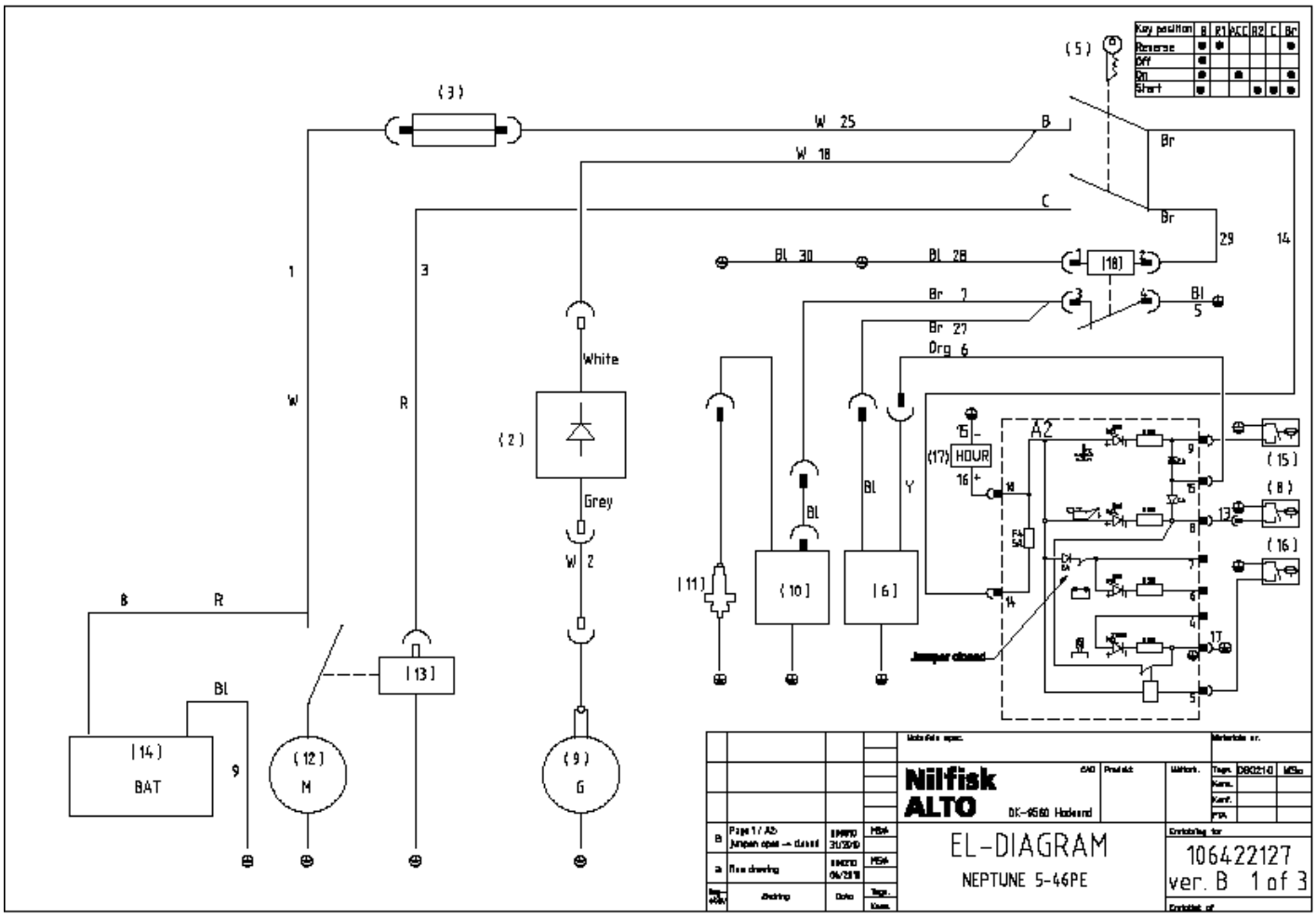


Temperature sensor exhaust

Temperature sensor water outlet

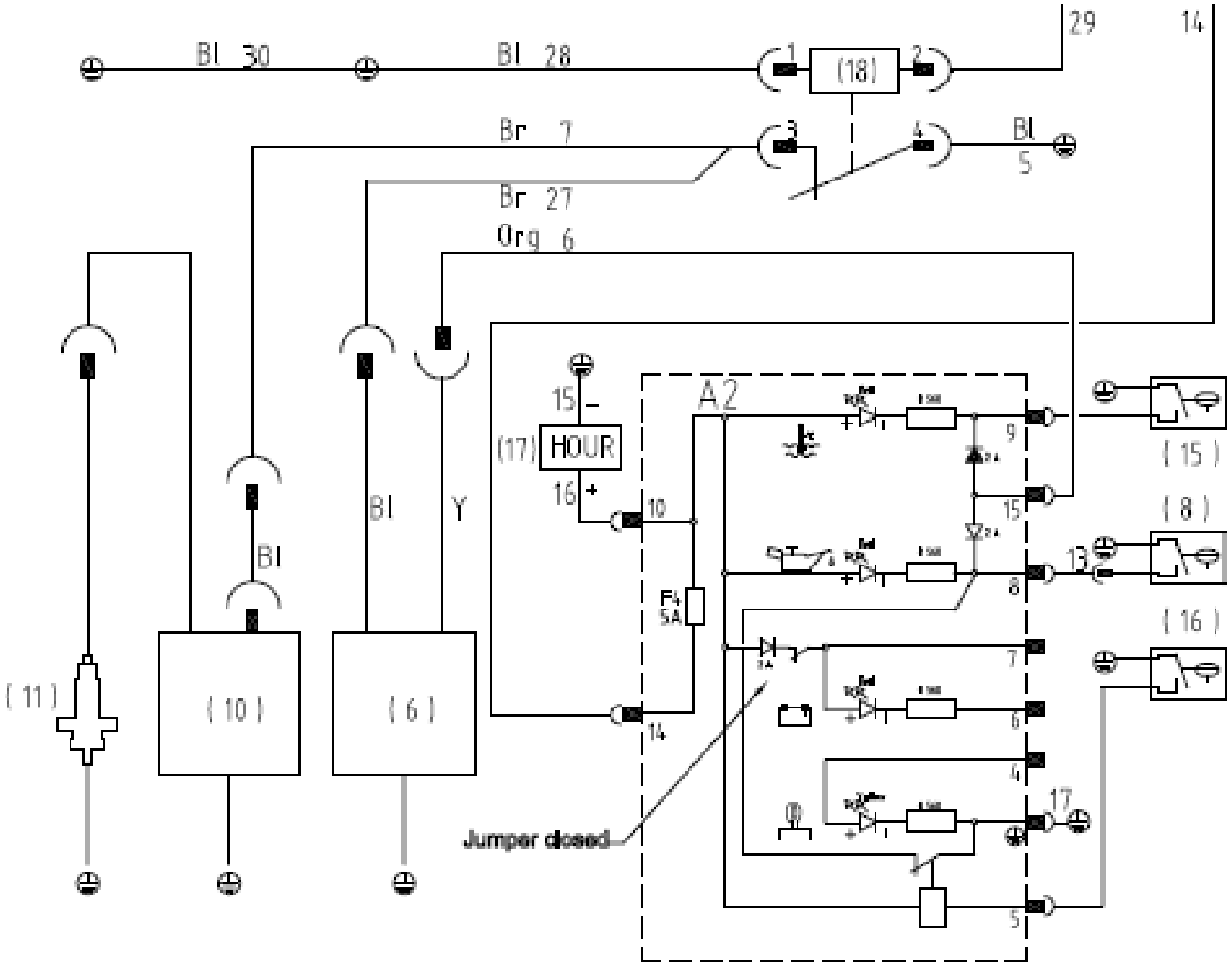
Flow switch 1 and 2

Functional desription of NEPTUNE 5-46PE, 5-54PE and 7-61PE



Start the motor by shortly turning the key (5) into the start position. When you let go the key, the key moves back to the ”ON” position.
When the key is turned to the start position, the start relay (13) is pulled, and the start motor is turning the motor.
In the ”ON” position the battery is continuously charged by the AC generator (9) through the rectifier (2).
With the key in “ON” position, the hour counter will count, no matter if the motor is running or not.

Functional desription of NEPTUNE 5-46PE, 5-54PE and 7-61PE



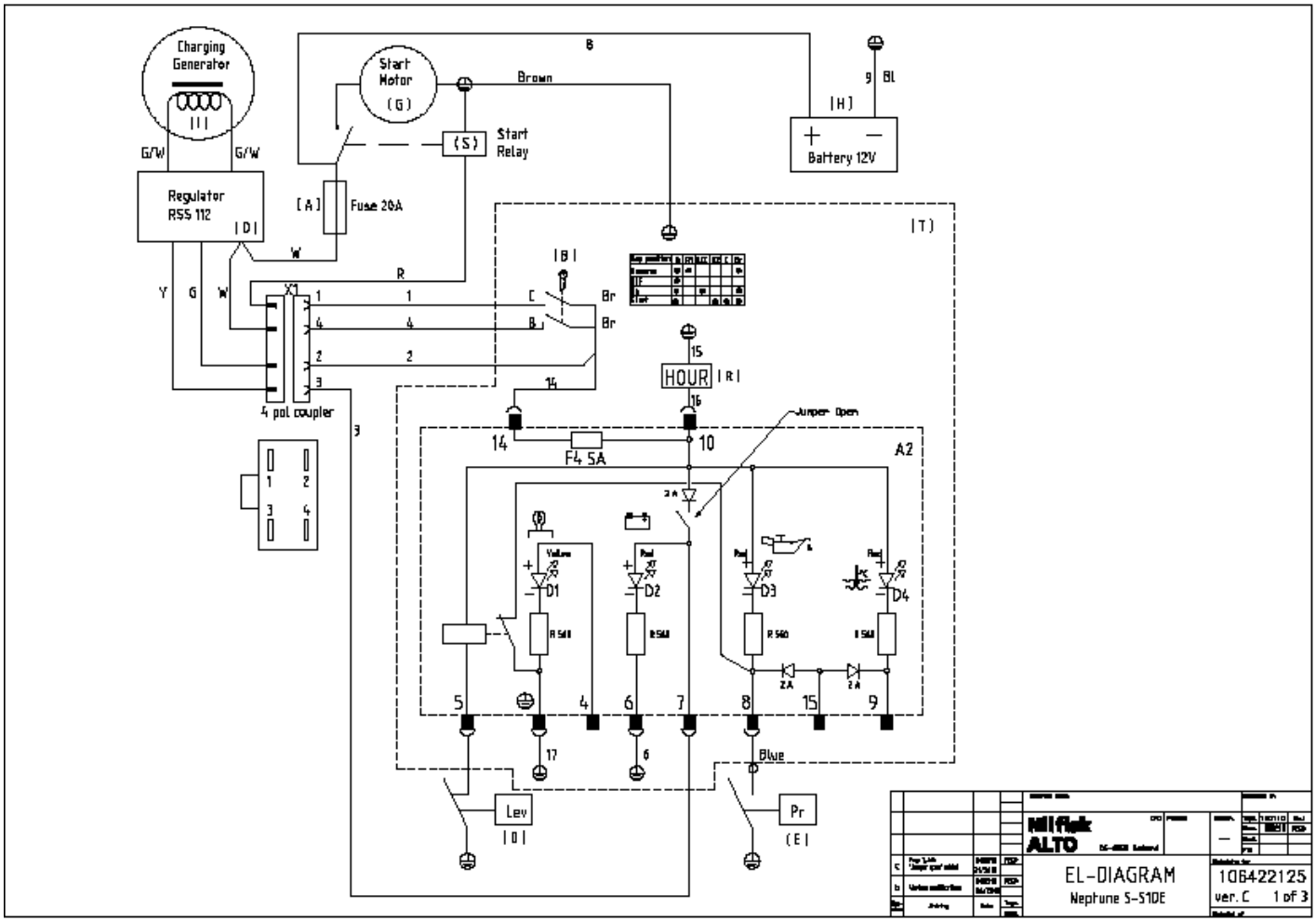
Circuit board (A2) is monitoring the thermostat on the high pressure pump (15), the motor oil switch (8) and the oil level switch in the high pressure pump.

If the thermostat on the pump or the motor oil switch is closing (failure) is respectively input 9 and input 8 connected to ground, which causes the LED to light, and at the same time output 15 is connected to ground.

If the oil level switch closes (failure) input 5 is connected to ground, output 15 is also connected to ground, which pulls the relay (6) and the motor stops. Also the LED for low oil level will light up.

On this model it is important that the jumper on A2 (2A) is NOT mounted.

Functional desription of NEPTUNE 5-51DE



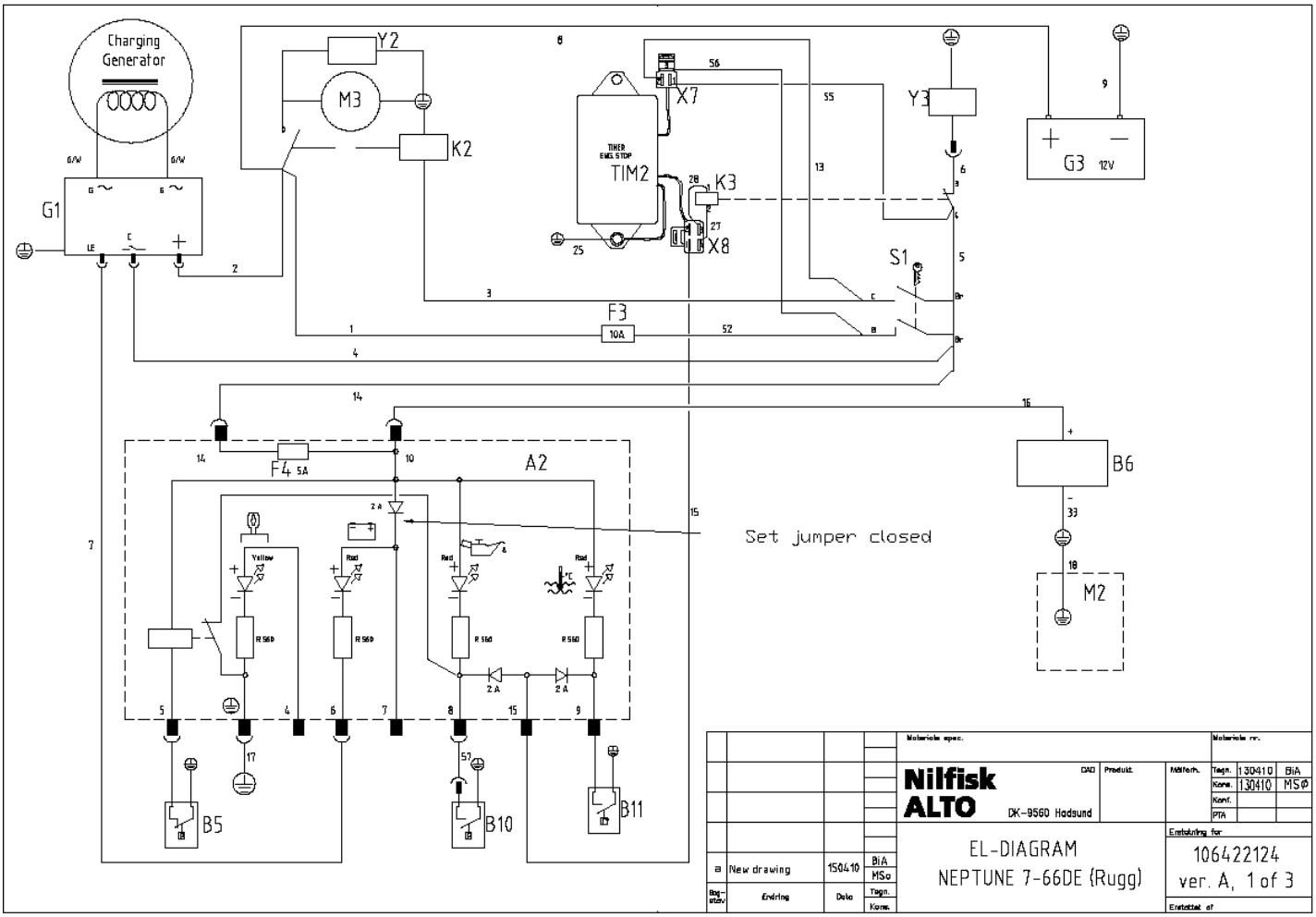
Start the motor by shortly turning the key (5) into the start position. When you let go the key, the key moves back to the ”ON” position.
When the key is turned to the start position, the start relay (13) is pulled, and the start motor is turning the motor.

Circuit board (A2) is monitoring the thermostat (E) on the high pressure pump, the motor oil switch (D) and the oil level switch in the high pressure pump.
If the thermostat (E) on the pump is closing (failure) is input 8 connected to ground, which causes the LED to light, and at the same time output 15 is connected to ground**.??????????????????????**

If the charging generator (I) is not charging, wire (Y) in the regulator (O) is getting 12V and also the input 7 on A2 is then getting 12V, which makes the charging light lighten.

On this model it is important that the jumper on A2 (2A) is NOT mounted, for the charging system to work properly.

Functional desription of NEPTUNE 7-66DE



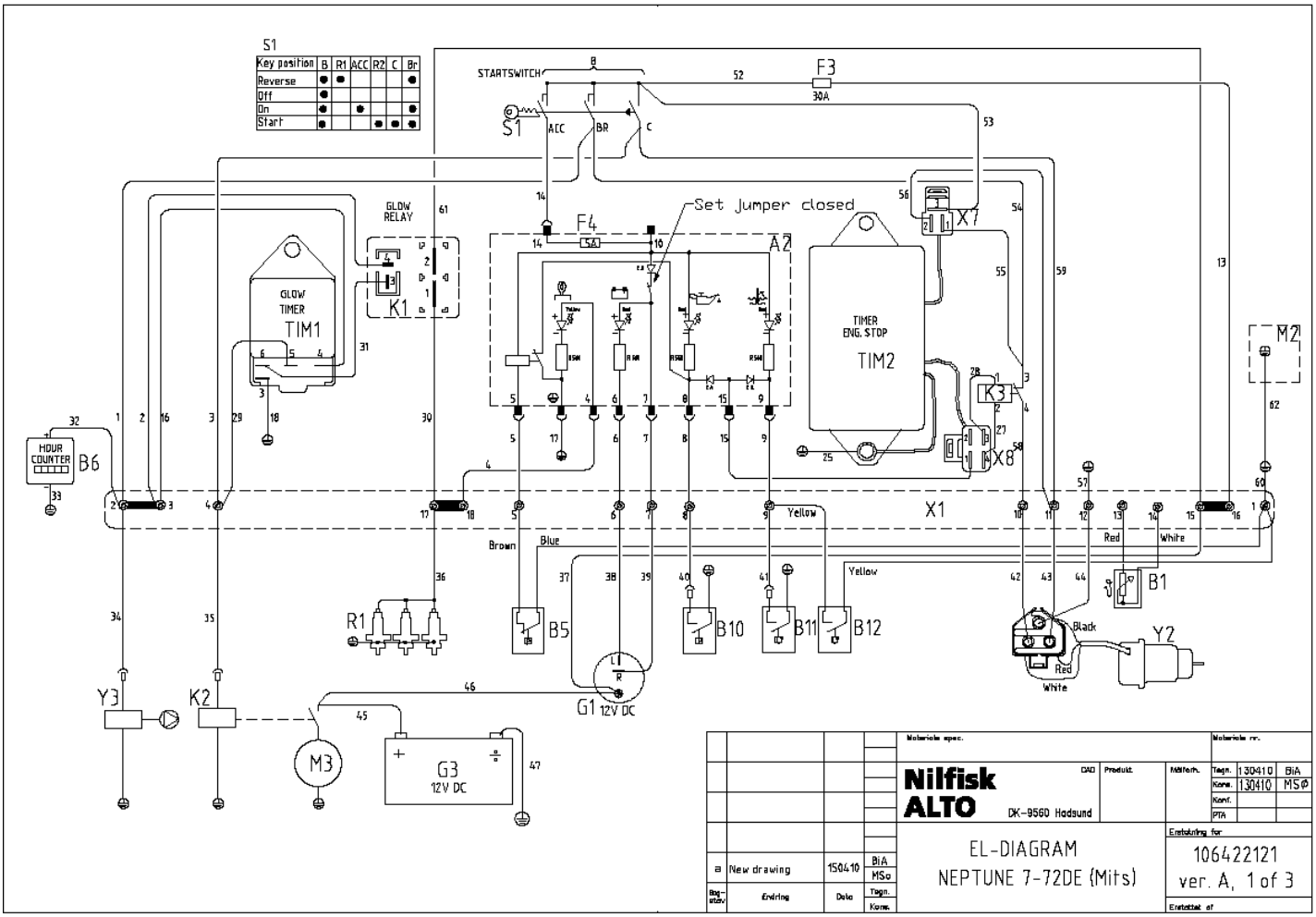
When the key (S1) is turned to start, the start relay is pulled and the motor starts. Then let go the key, and it moves back to the ”ON” position.

The motor oil pressure switch (B10) is a normally closed switch. In closed position (motor not running) the switch is connected to ground. When the motor starts and the RPM increases the motor oil pressure increases the switch opens and there is no connection to ground anymore. When no connection to ground there is no ground on output 15, which means the motor runs.
If output 15 is connected to ground 5 sec. after the key is turned back to “ON” position, contactor K3 is pulled, and the fuel pump is disconnected for 9 sec. (done by TIM 2—Timer for motor stop) — motor stops.
If there is a failure on sensor B5, B 10 or B11, and by that output 15 is connected to ground, the fuel pump will be disconnected in 9 sec., and the motor will stop.

If the 12V charging is not functioning input 6 on A2 will be connected to ground.

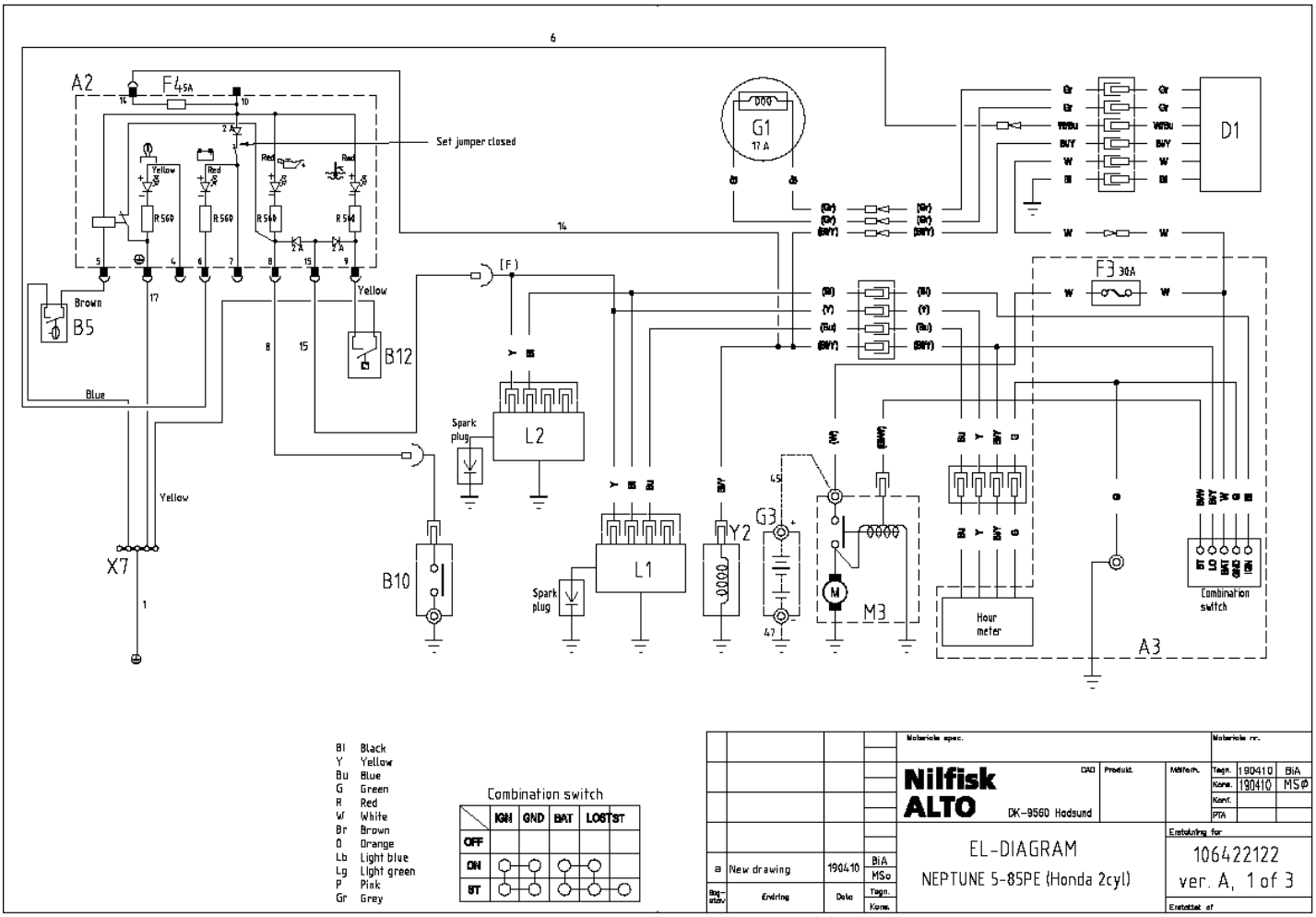
IMPORTANT: JUMPER ON A2 MUST BE MOUNTED

Functional desription of NEPTUNE 7-72DE



When the key (S1) is turned to the ”ON” position, the glow timer (Tim1), and the glow relay (K3) is activated, and the glow plugs (R1) are heating, and also the glow lamp on A2 is lightening. After a short while the timer runs out and the glow relay opens.
Now the key can be turned to the start position, and the starter coil (Y2—red wire), together with the holding coil (Y2—white wire) is pulled and runs the starter motor, and the motor will start.
Now release the key, so it goes back to the “ON” position, the starter coil (Y2—red wire) is no longer pulled, but the holding coil (Y2—white wire) is kept hold through the contactor (K3).
If there is a failure on B5 (oil level switch pump oil), B10 (Motor oil switch), B11 (thermo switch motor) or B12 (thermo switch high pressure pump), output 15 on A2 is connected to ground, contactor K3 opens and the holding coil Y2 opens and the motor stops.
It is important that the jumper is mounted on the circuit board (A2). When jumper mounted there is 12VDC on output 7 on A2. Output 7 is connected to connection “R” on the generator. The generator (G1) can only give output, if there is 12VDC present on connection “R”. If the generator is “worn/ defect” the DC voltage on connection “L” drops down to 0 VDC, and input 6 on A2 in then connected to ground, and the charging LED will light up.

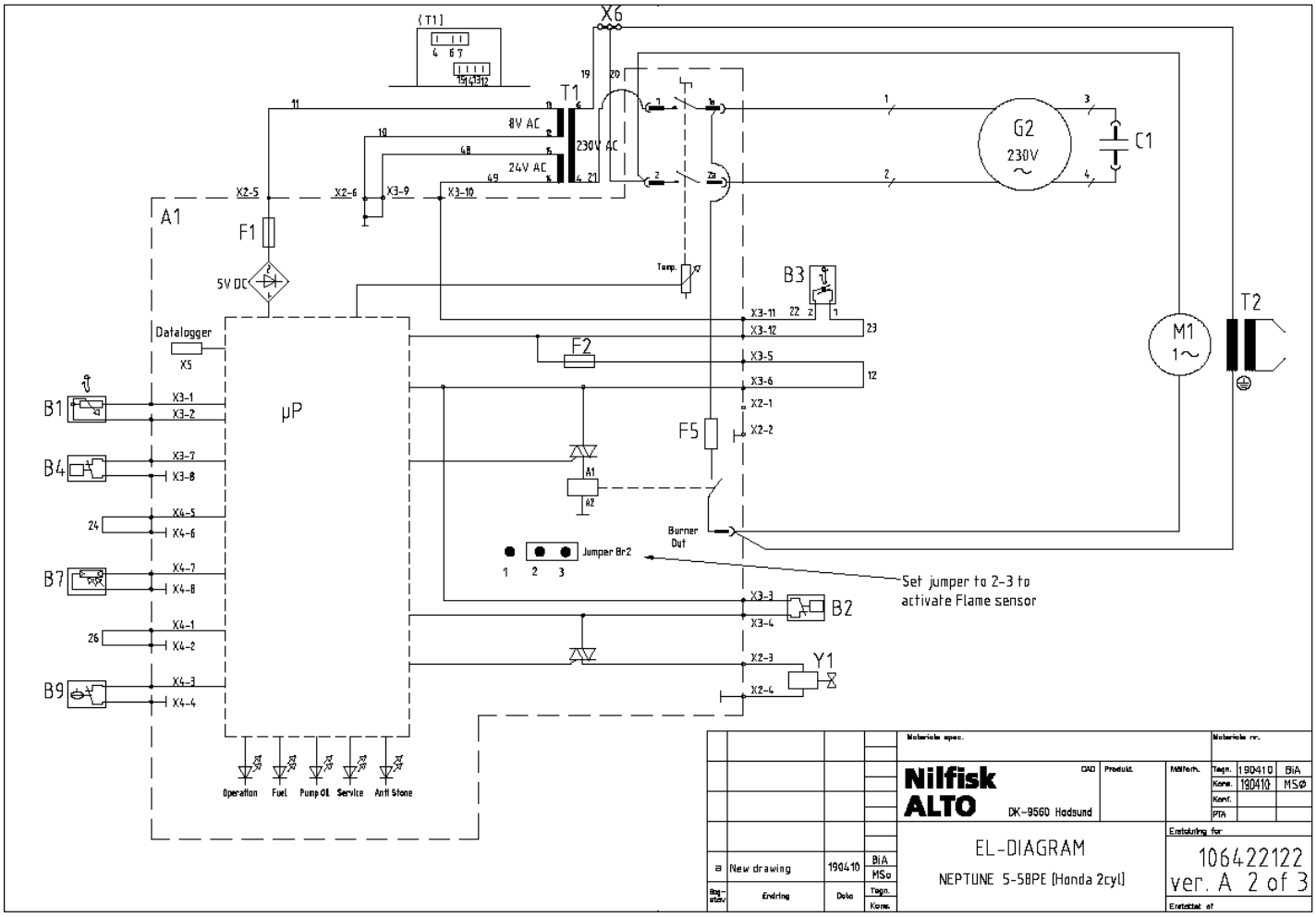
Functional desription of NEPTUNE 5-85PE



If there is a failure on B5 (oil level switch pump oil), B10 (motor oil switch) or B12 (thermo switch high pressure pump) is output 15 on A2 connected to ground. At the same time input “F” on the Honda motor is connected to ground, and the Honda motor will stop.

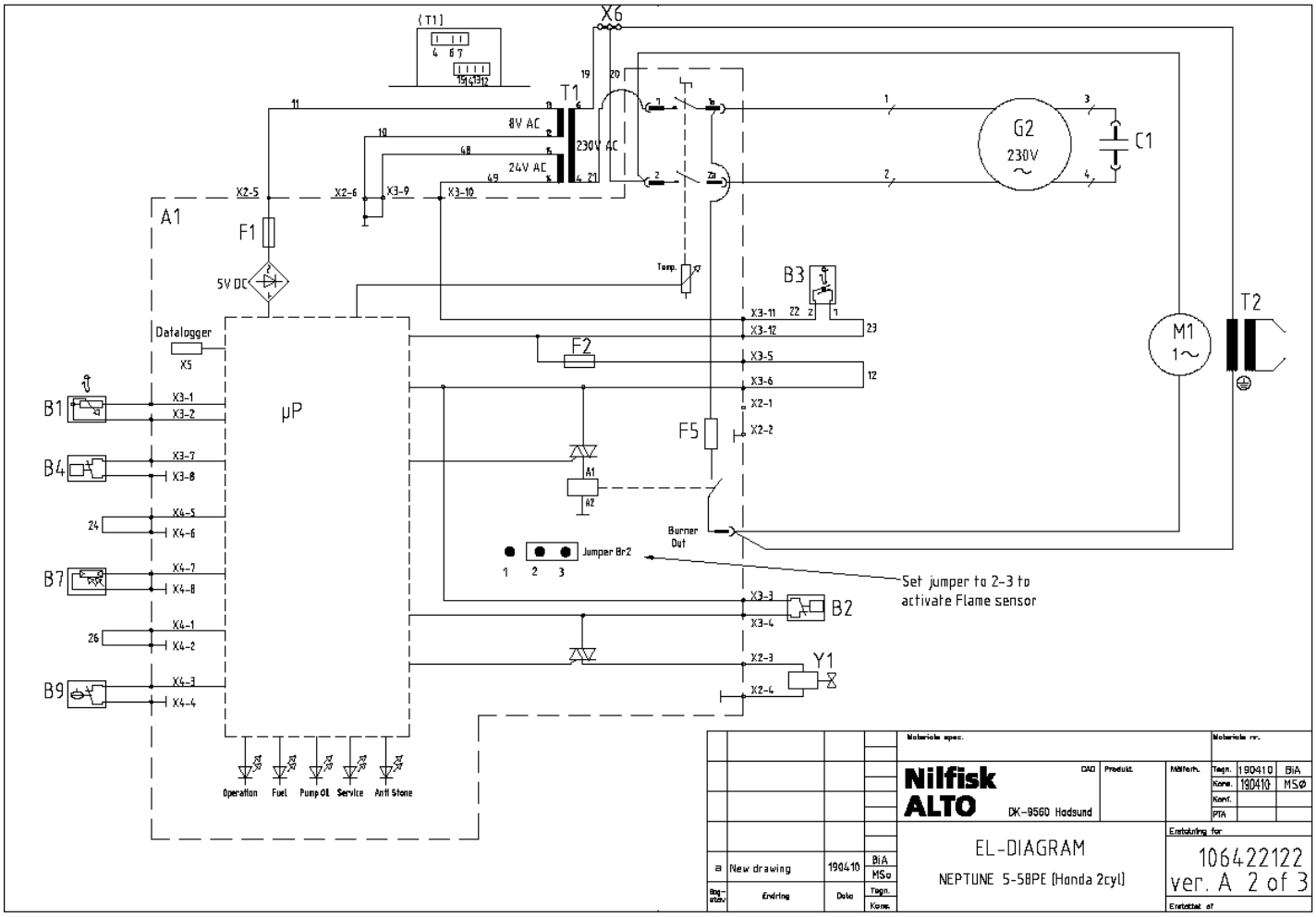
IMPORTANT: JUMPER ON A2 MUST BE MOUNTED

Functional desription of Circuit Board, A1



The circuit board used in all NEPTNE PE/DE machines is the same as used in NEPTUNE 3.
The only difference is the following bridges which are mounted on the circuit board in the NEPTUNE PE/DE machines.
X4,5 to X5,6—oil level switch high pressure pump. Oil level switch is moved to circuit board A2
X4,1 to X4,2—Anti-stone
X3,5 to X3,6—Thermal switch in high pressure pump motor.

Functional desription of Circuit Board, A1



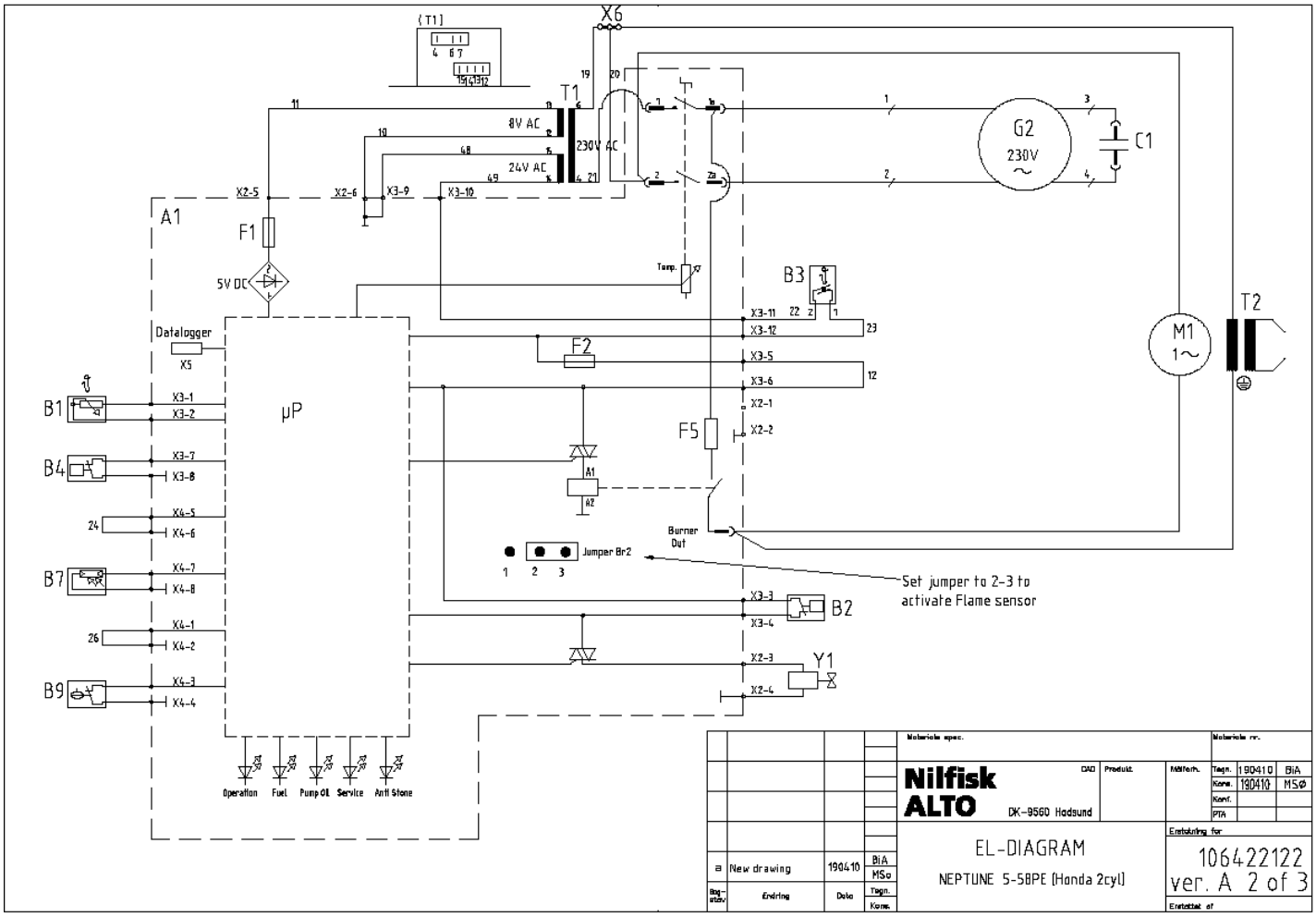
Control Circuit Board (A1) is functioning the same way in all the NEPTUNE PE/DE models. The power supply to A1 is supplied by the 230V generator G2, which is driven by the motor. This means that the motor must be running—and running at full RPM—before the A1 is working. In cold water mode the S1 main switch can be in position ON or OFF. If S1 is turned to the temperature area (red) the hot water mode is activated.

When S1 is turned to ON power is supplied through the fuse F1 to the microprocessor. The microprocessor is starting up, and the 5 status LED's is lightening up for 1 sec. If there is a failure during start up, the control circuit board goes into failure mode.

If the S1 main switch is turned to "hot water mode", and the spay gun is open, and desired temperature set at S1, B1 temperature sensor is measuring lower temperature that the set point at S1, and B9 fuel level sensor is measuring fuel in the tank, and B2 flow switch, and B4 flow switch is registering water flow, the burner motor M2 is started, and the ignition transformer T2 is started over the burner relay K3. A high voltage spark is generated between the electrodes in the burner.

The burner motor M2 is driving the burner fan, which is blowing pre-heated air into the boiler. The self-sucking fuel pump is pumping fuel pressure up to the fuel solenoid valve Y1. When the burner motor/fan has been running in 1 sec., the fuel solenoid valve Y1 opens, and the fuel is pumped under pressure to the fuel nozzle. The atomized fuel is leaving the fuel nozzle and is ignited.

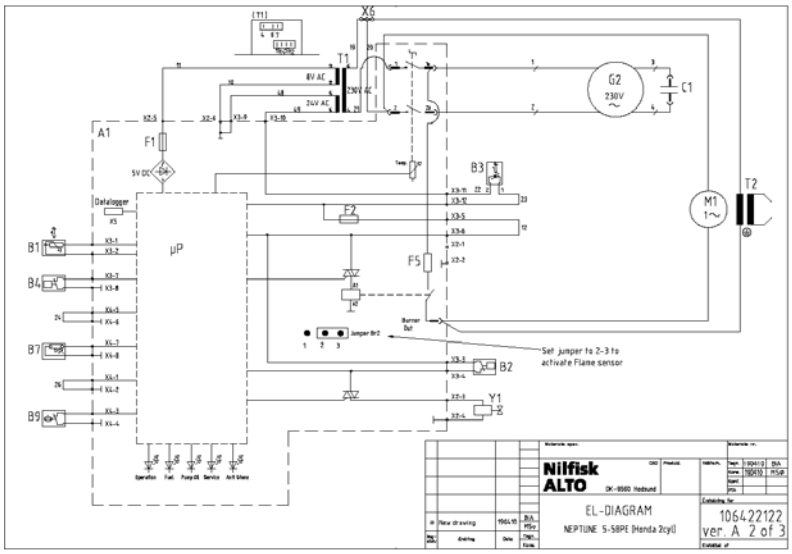
Functional desription of Circuit Board, A1—Continued



The flame sensor B7 is controlling if the fuel is ignited, and if it is (the flame sensor can see the flame) it “allows” the burner to burn.
If the flame sensor don’t see the flame after 4 sec. (when S1 is in hot water mode), the fuel solenoid valve will close, and the burner will be stopped.

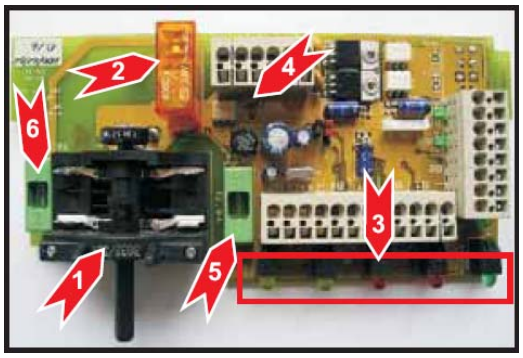
If the display is flashing in the LED’s, it can be due to too low RPM on the motor.
If the LED’s are flashing, it means that the voltage is too low to maintain the circuit board.
The flashing LED’s means that the display is “re-starting” all the time.

Functional desription of Circuit Board, A1—Continued



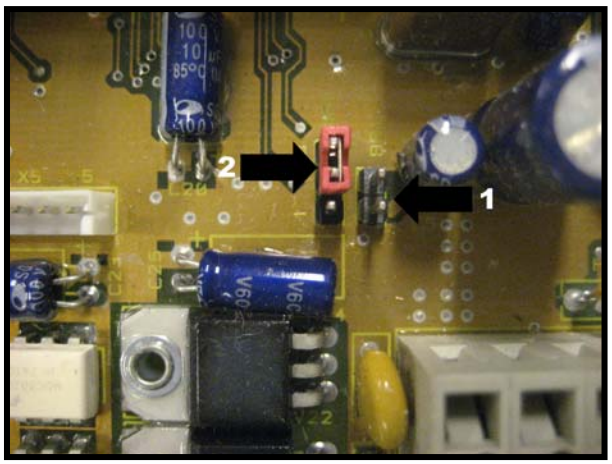
Circuit Board A2 (A1)

Circuit board (A2) has LED's for the motor, e.g. water temperature, motor oil level etc.



Control Circuit Board A1

Control Circuit Board:
Pos. 1: The heating and ON/OFF switch (S1)
Pos. 2: Heating Relay (K2)
Pos. 3: LED's
Pos. 4: Fuse—Self-resetting "Pico fuse"
Pos. 5: Fuse
Pos. 6: Fuse

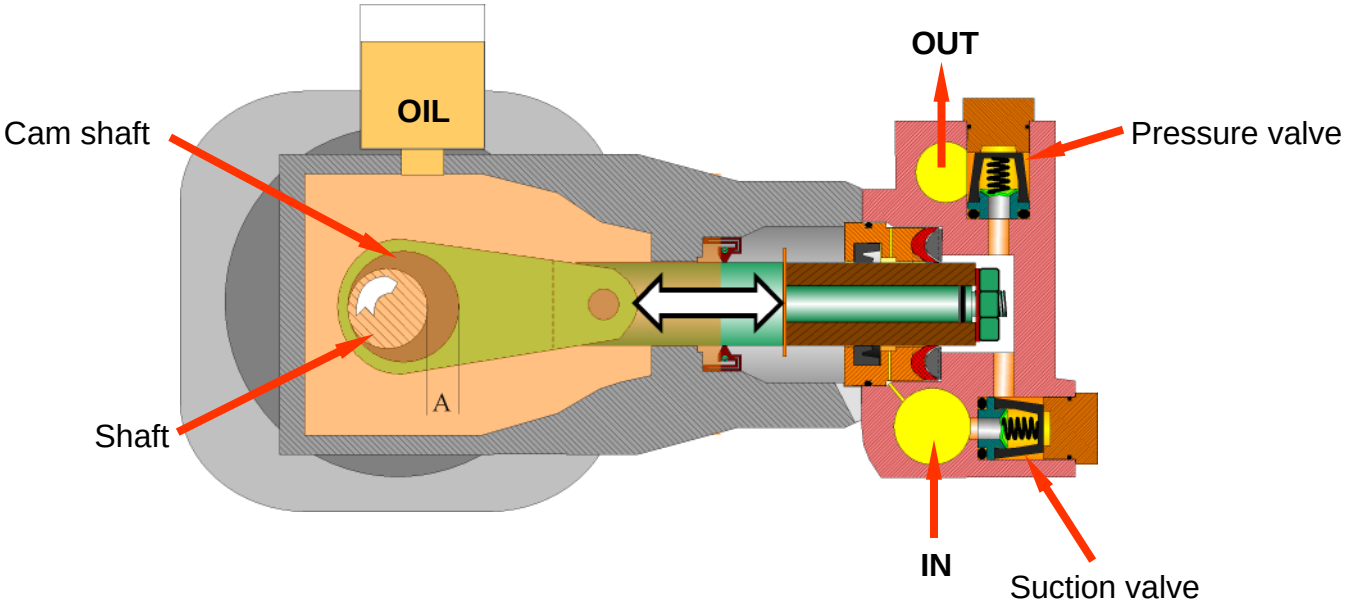


On the above picture is the correct setting of the circuit board.
Arrow 1
Setting is WITHOUT JUMPER = **By-pass time active**

Arrow 2:
Setting is JUMPER MOUNTED ON PIN 2 AND 3 = **Flame Sensor active.**

NEPTUNE PE/DE—NP5 PUMP

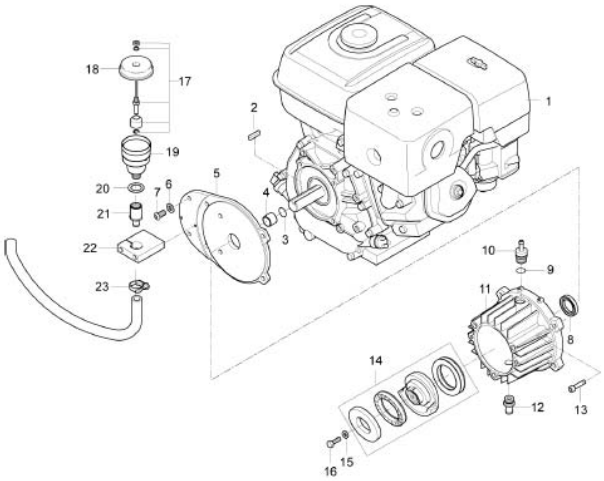
The 3piston radial pump NP5 is used in the NEPTUNE 5-85PE and 5-51DE



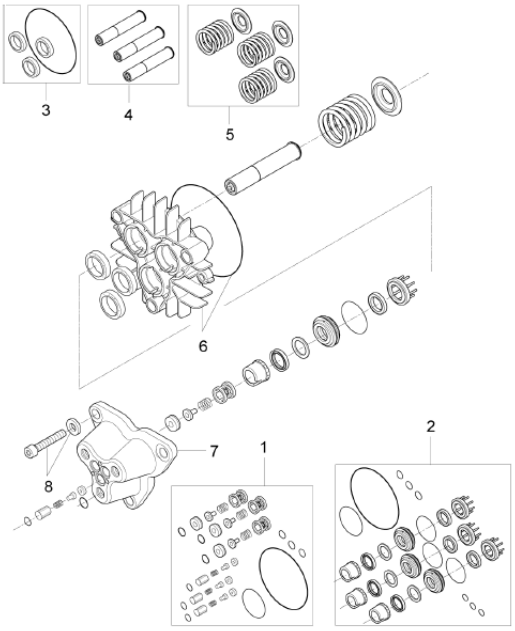
The three pistons are driven by the motor via a belt drive. The cam shaft transforms the rotation power into the pistons reciprocating movements.
The movement and the diameter of the pistons decide the water volume which can be sucked into the suction valves and pressed out through the pressure valves.

NEPTUNE PE/DE—NA5 PUMP

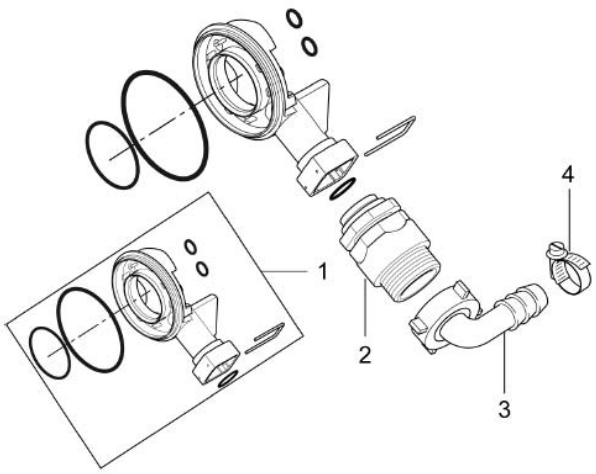
The 3piston NA5 pump is used in the NEPTUNE 5-46PE and 5-54PE



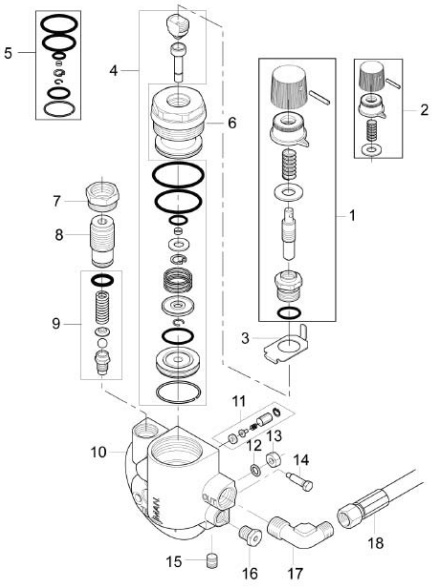
Honda motor and D-bearing cover



Pistons, cylinder block,cylinder head and sealings



Water inlet

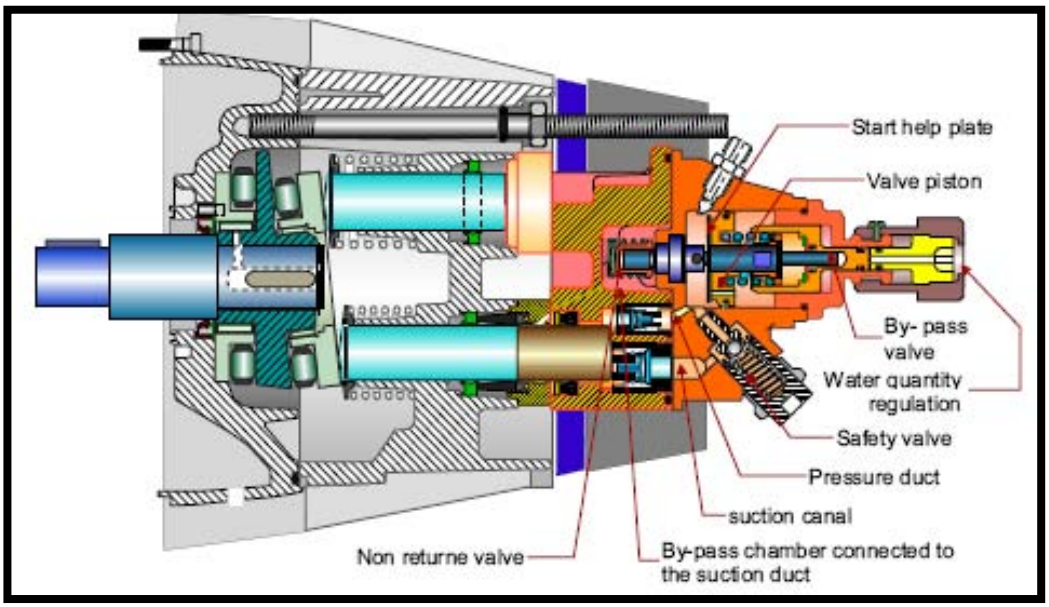


By-pass valve with water regulator

The NA5 pump is connected to the Honda motor with a direct drive.
By-pass valve function is described later in this service manual.

NEPTUNE PE/DE—C3 PUMP

The 4 piston C3 pump is used in the NEPTUNE 7-61PE, 7-66DE and 7-72DE



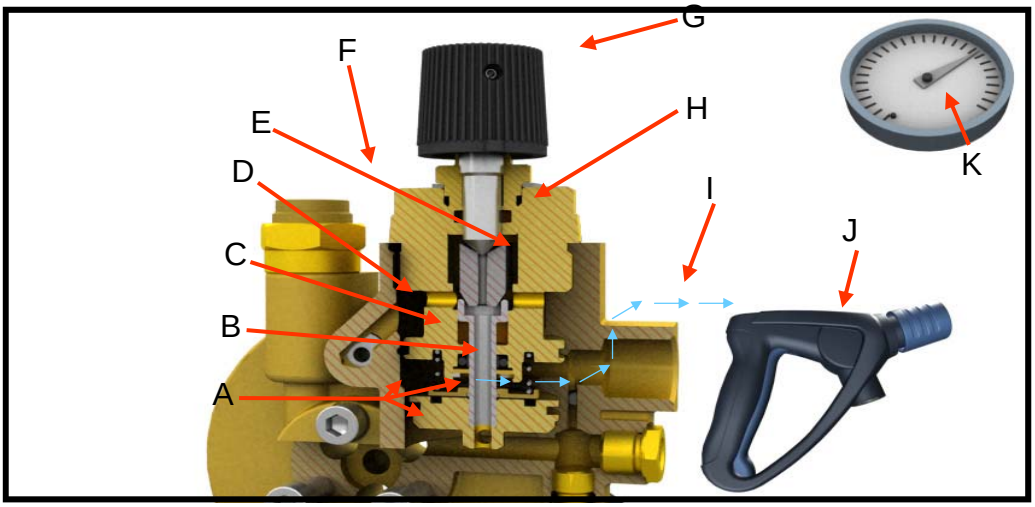
The wobble disc is mounted directly on the motor shaft.

Water is sucked through the suction valves and out through the pressure valves and the piston in the by-pass valve. The piston has two small holes where the water is running through in order to create a pressure drop, which make sure the valve cone is closed during operation.

When water flow is interrupted, the pressure rises until the safety valve opens. Because of the achieved pressure drop, the valve cone is pressed to open so the water re-circulates at a pressure < 10 bar.

Water quantity is regulated by a handle in the end of the by-pass valve. When turning the handle clockwise, the by-pass valve cone will be forced open, so some of the water is re-circulating in the pump.

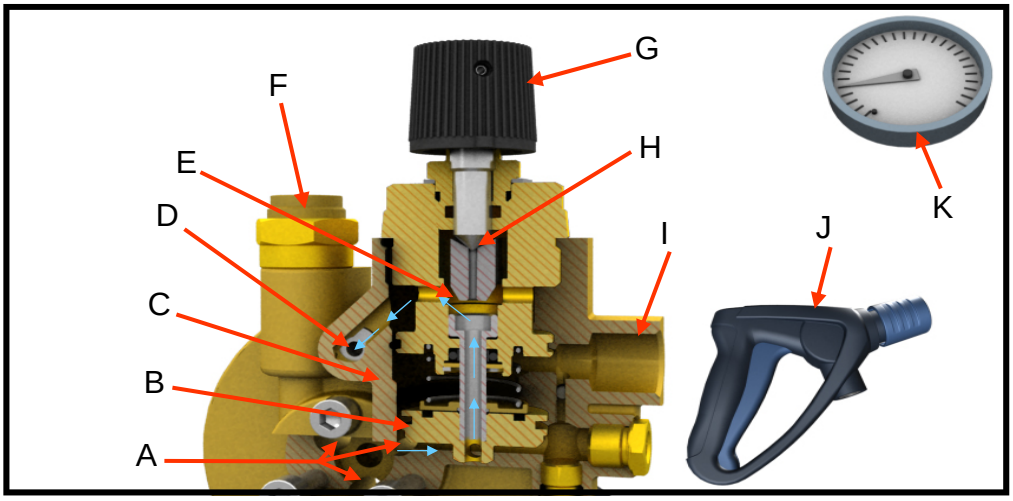
By-Pass valve function NEPTUNE 5-46PE and 5-54PE



Working pressure

Machine is started and the gun ”J” with correct lance/nozzle is open -
Machine runs in working pressure ”K”:

The water is pressed from the pump outlet ”A” into the by-pass housing ”C”.
The water runs through the bottom of by-pass housing ”C” and directely to the outlet ”I”.
Due to the water pressure the by-pass piston ”B” is pressed up and the seat ”E” is closed.



By-pass pressure

Machine is started and the gun is closed - By-pass pressure:

When the gun ”J” closes, the pressure inside the by-pass housing equalizes and the by-pass piston ”B” is pressed down by the tension of it’s spring. The seat ”E” in the top of by-pass piston opens. The water runs from the pump outlet ”A” into the by-pass housing ”C”. Due to the closed gun ”J” and the opening in the by-pass seat ”E”, the water runs back into the suction side of the pump through the valve ”D”.

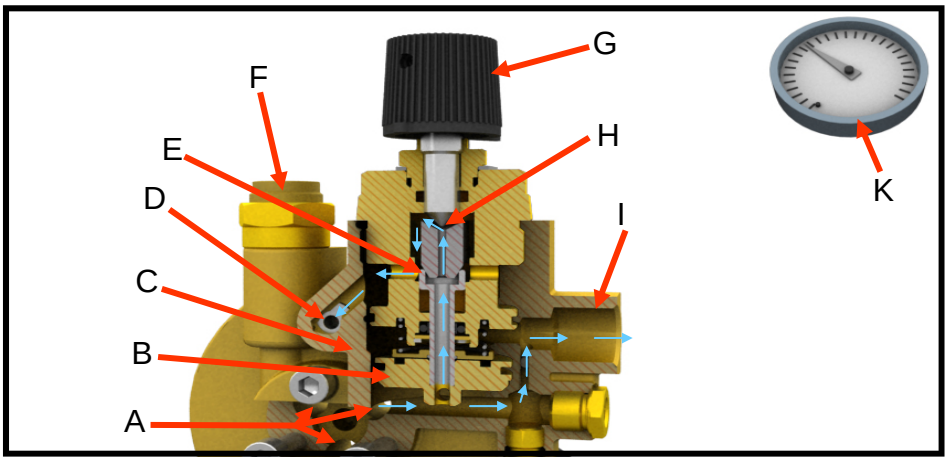
By-Pass valve function NEPTUNE 5-46PE and 5-54PE

By-pass pressure

The by-pass pressure is determined of the spring tension in valve ”A”.
The tension is fixed and will bring out a by-pass pressure in about 30 - 35 bar.
Valve ”A” also secures the self suction ability.

The cut off pressure when the gun is released, is determined of the adjustment screw ”B”.
When the screw is tightened the cut off pressure will rice and by loosening it the pressure will fall.

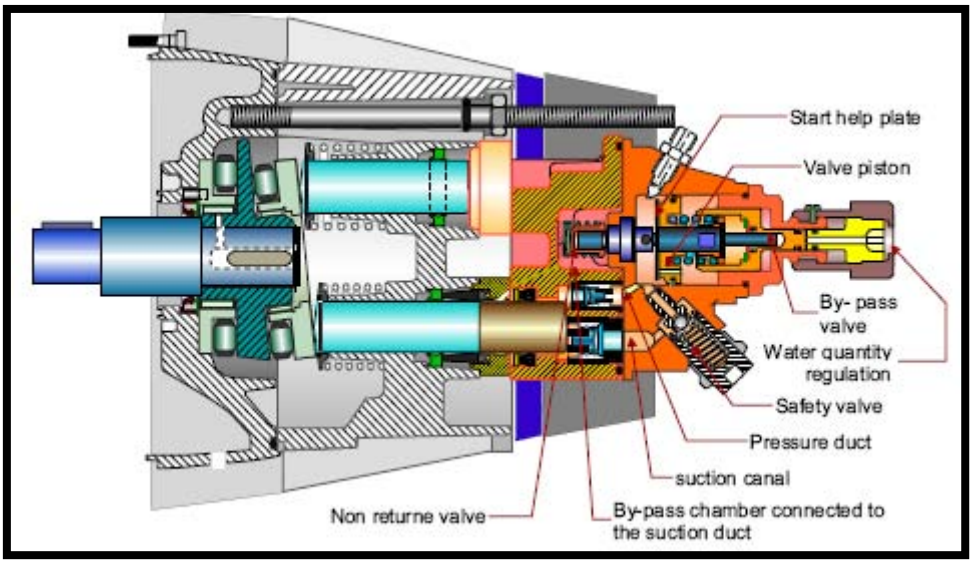
The safety valve ”C” has no function under normal circumstances. The pressure of the safety valve is set to about 25 - 30 bar above the cut off pressure.
The safety valve will open if the by-pass valve is stocked and lead water to the suction side of the pump.

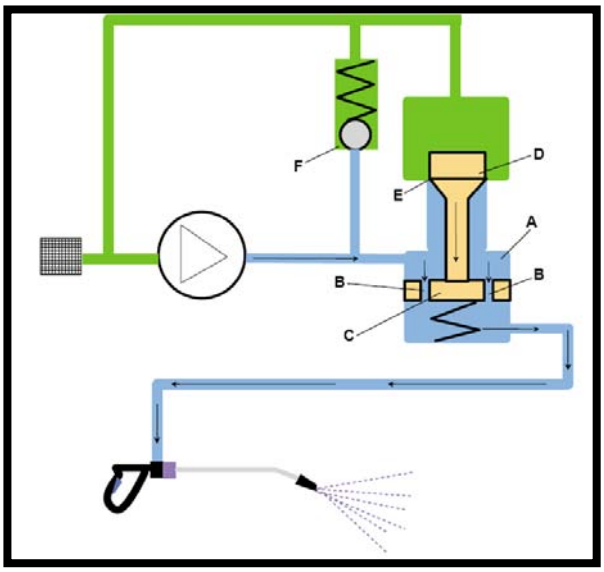


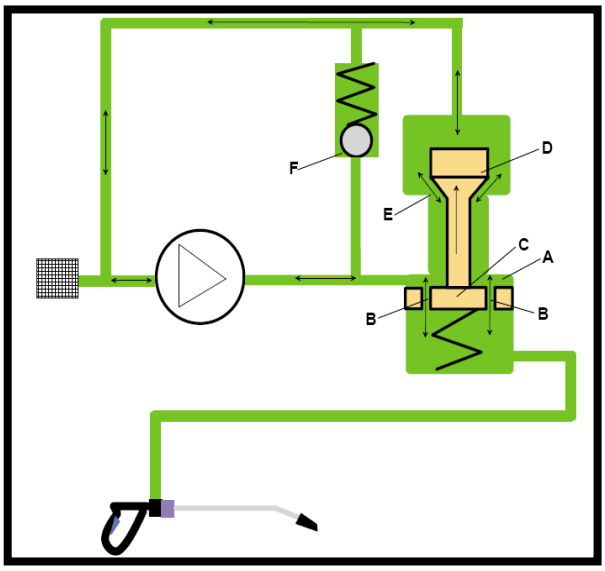
Water reduction

When the water regulation ”G” is turned counter clock wise, the seat ”H” opens and the water runs both to the outlet of the by-pass housing and in by-pass to the suction side of the pump.
The pressure ”K” will fall depending of the size of the opening in seat ”H”.

By-Pass valve function NEPTUNE 7-61PE, 7-66DE, 7-72DE





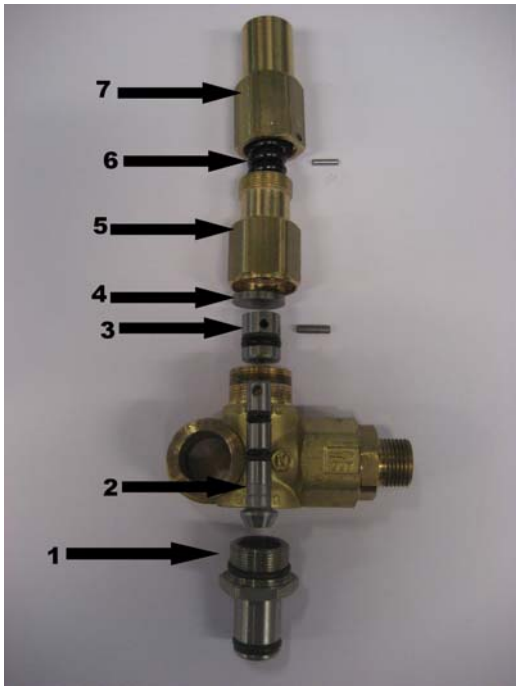


Operation:
The water from the pump is lead into the chamber ”A” in the by-pass valve. From here the water passes through the holes “B” in the by-pass valve piston “C” and out to the high pressure nozzle. When water is pressed through holes in the piston “C”, there is a pressure drop over the piston (this means the pressure is higher on one side of the piston). This will keep the valve cone “D” closed against its seat “E”, because the piston “C” is fixed to the valve cone.

By-Pass:
When the water consumption stops (spray handle is released/closed), the pressure drop over piston “C” disappears, the pressure in the by-pass valve increases briefly until the safety valve “F” opens. The safety valve just opens briefly, and closes again. The safety valve opens when the pump pressure overcomes the tension of the spring in the safety valve. (The safety valve is adjusted to open 25-30 bar above normal working pressure). Now the valve cone “D” lift from its seat “E”, and water runs in by-pass.

Unloader valve function NEPTUNE 5-85Pe AND 5-51DE

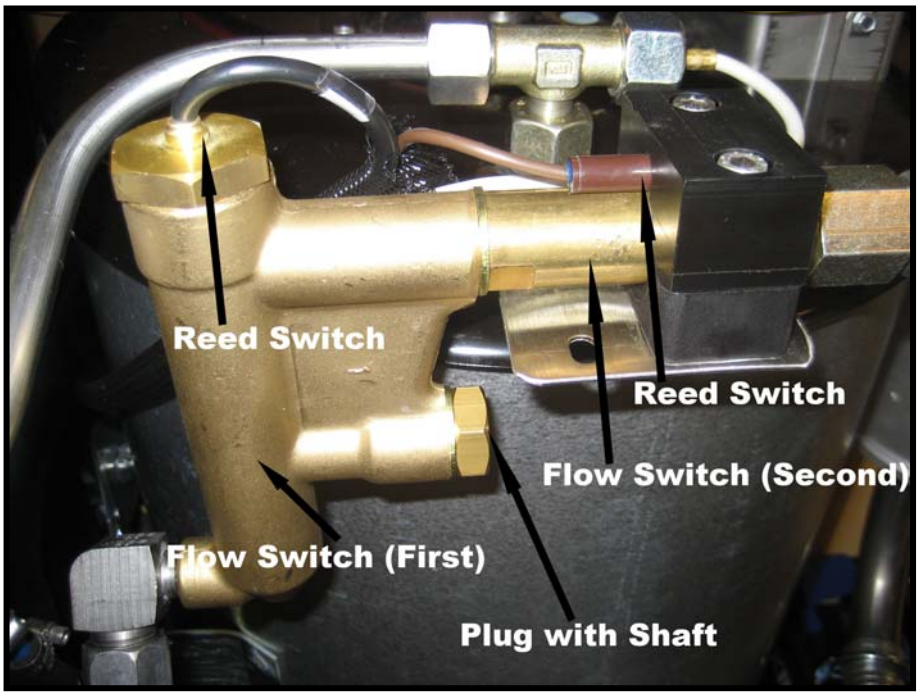
Unloader mounted on pump



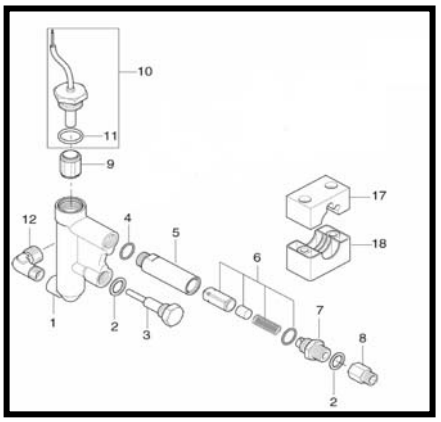
Unloader disassembled

Unloader function:
On the assumption that the black handle (adjustment handle) on the unloader is turned all the way to max. pressure (clockwise).
When the pump is running the unloader piston (2) is pressed down it its seat (1), and all the water volume is going through the gun and out to the high pressure nozzle.
When the gun is released (no water flow out), the pressure in the unloader will rise, and the increased pressure will overcome the adjusted tension of the unloader spring (6), and the unloader piston (2) will be lifted up from its seat.
Water will now return through the seat (1) to the suction side of the pump (by-pass) mode.

Flow switch function NEPTUNE PE



Flow switch



Plug with Shaft

Water supply connected to the machine.
Water from the pump is pressed through the high pressure hose to the first flow switch.
When water is entering the first flow switch, the piston with magnet is pressed to the top of the flow switch housing, and the reed switch is making contact and closing the circuit.
(Reed switch is a NO contact)

Water is now pressed through the second flow switch, the piston with magnet is pressed to the far end of the housing, and the reed switch is making contact and closing the circuit.

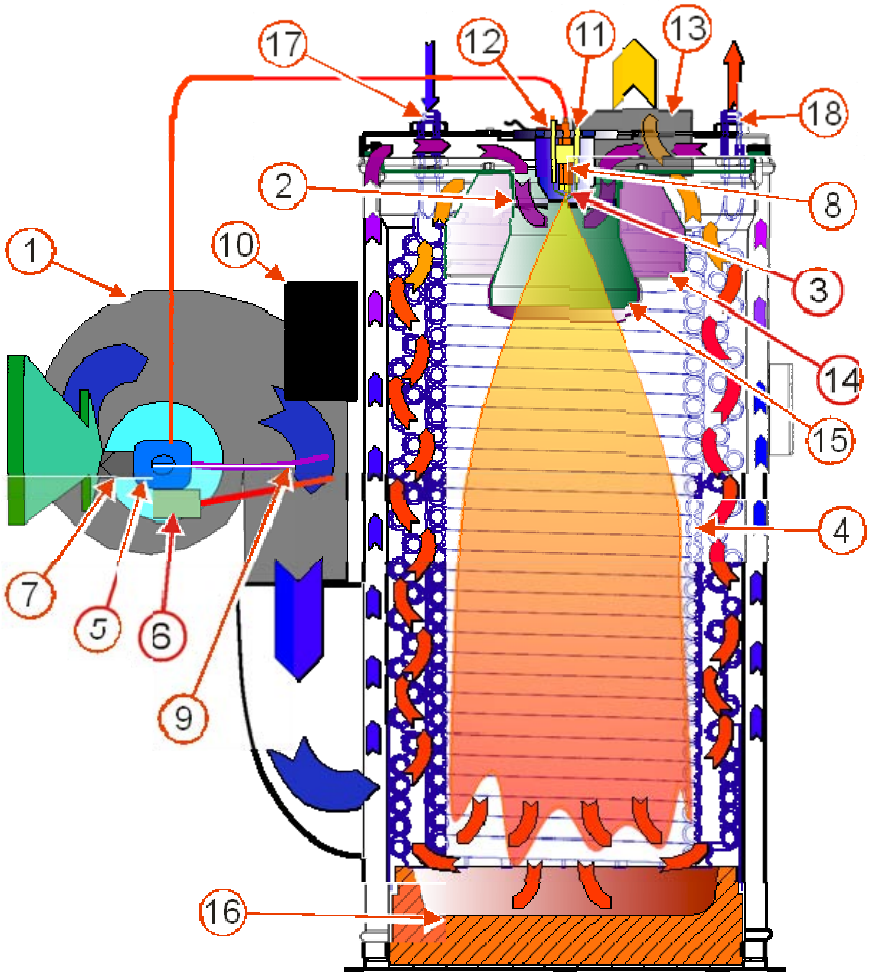
When the spray handle is released and the water flow stops, the flow switch pistons will move away from the reed switches, and the will brake off the circuit and the burner will stop.

When the water flow stops, the piston in the first flow switch will fall down and be stopped by the plug with the shaft. The plug with shaft is installed to reduce the movement of the piston.

The signals from the two flow switches must come simultaneously. (MAX. difference between the two signals are 4 seconds)

The signals from the flow switches are controlling the fuel pump solenoid valve. This to make sure that the burner is not starting if there is no flow of water through the heating coil.

Heat exchanger NEPTUNE PE



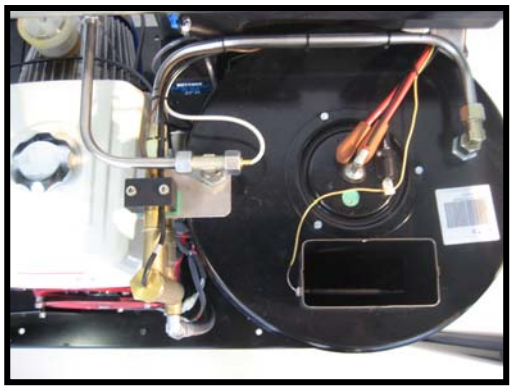
Heat exchanger (schematic)

Fig. D.19:

1) Burner fan
2) Baffle plate
3) Fuel nozzle
4) Heating coil
5) Fuel pump
6) Fuel filter
7) Solenoid valve
8) Nozzle stock
9) Fuel return line
10) Ignition transformer
11) Ignition electrodes
12) Flame probe
13) Flue
14) Flame sheath
15) Flame funnel
16) Insulation
17) Water inlet
18) Water outlet

The heat exchanger is the functional link between the heating subsystem and the water subsystem.
In "Hot water" mode the burner fan (1) draws in air and conducts it laterally into the heat exchanger where it is routed upwards between the two jackets to the baffle plate (2). This preheats the air before it mixes with the fuel spray from the fuel nozzle (3).
Cold water is fed to the inner circuit in which the temperature is highest. This reduces in as much as possible any condensation on the surface of the heating coil (4).
At the same time fuel is drawn in from the fuel tank by the fuel pump (5) through the filter (6). The fuel is conducted by the solenoid valve (7) to the nozzle stock (8) with the fuel nozzle (3). If no combustion is needed, the fuel goes back to the tank on the return line (9).
The ignition transformer (10) activated in "Hot water" mode generates ignition sparks across the electrodes (11) to ignite the fuel spray. This process is monitored by the flame sensor (12).
In normal operation the hot exhaust flows downwards and upwards between the piping of the heating coil (4) thus warming the water in the system.
The exhaust exits through the flue (13).

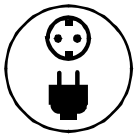
Safety Thermal Temperature Sensor in boiler exhaust



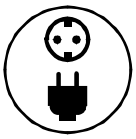
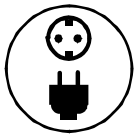
Located in the heat exchanger outlet (flue) is a temperature-dependent resistor (Pt 100) functioning as a temperature sensor.
If the temperature in the heat exchanger outlet (actual temperature) exceeds the temperature set-point, the solenoid valve Y1 closes to interrupt the fuel feed. The temperature sensor is only activated in "Hot water" mode.

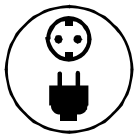
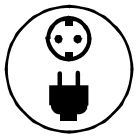
The safety thermal release mounted on the heat exchanger water inlet, is an absolute safety element on the heat exchanger.
If a fault is present, e.g. all control and safety devices fails, and hot water flows at high pressure from the heat exchanger back through the safety valve into the high pressure pump, the thermal release responds and shuts down the entire machine through the control circuit. Before restarting, the machine must cool down, the fault causing the heated water to flow in the wrong direction must be corrected, and a new thermal release fitted.

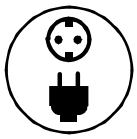
The flame sensor is a light-sensitive phototransistor.
The flame sensor checks for the presence of a flame.

Fault	Cause	Remedy
Green **LED** illuminates. 	⇒ Machine ready to opeate. All LEDs flash once before the motor is turned on.	
Yellow **LED** illuminates.	⇒ Fuel level is low.	• Refill fuel. "Cold water" mode is possible.
Yellow **LED** flashes.	⇒ Alto Anti Stone level is low.	• Refill Alto Anti Stone. "Hot water" and "Cold water" mode is possible.
Red **LED** illuminates.	⇒ Pump oil level is low.	• Refill pump oil (Chapter F.1.3). The burner and motor are cut out. The green **LED extinguishes**.
Red **LED** flashes.	⇒ Service interval: service due in 20 hours.	• Service the machine. "Hot water" and "Cold water" mode is possible.
Red **LED** illuminates.	⇒ Service interval elapsed.	• Service the machine. "Hot water" and "Cold water" mode is possible.

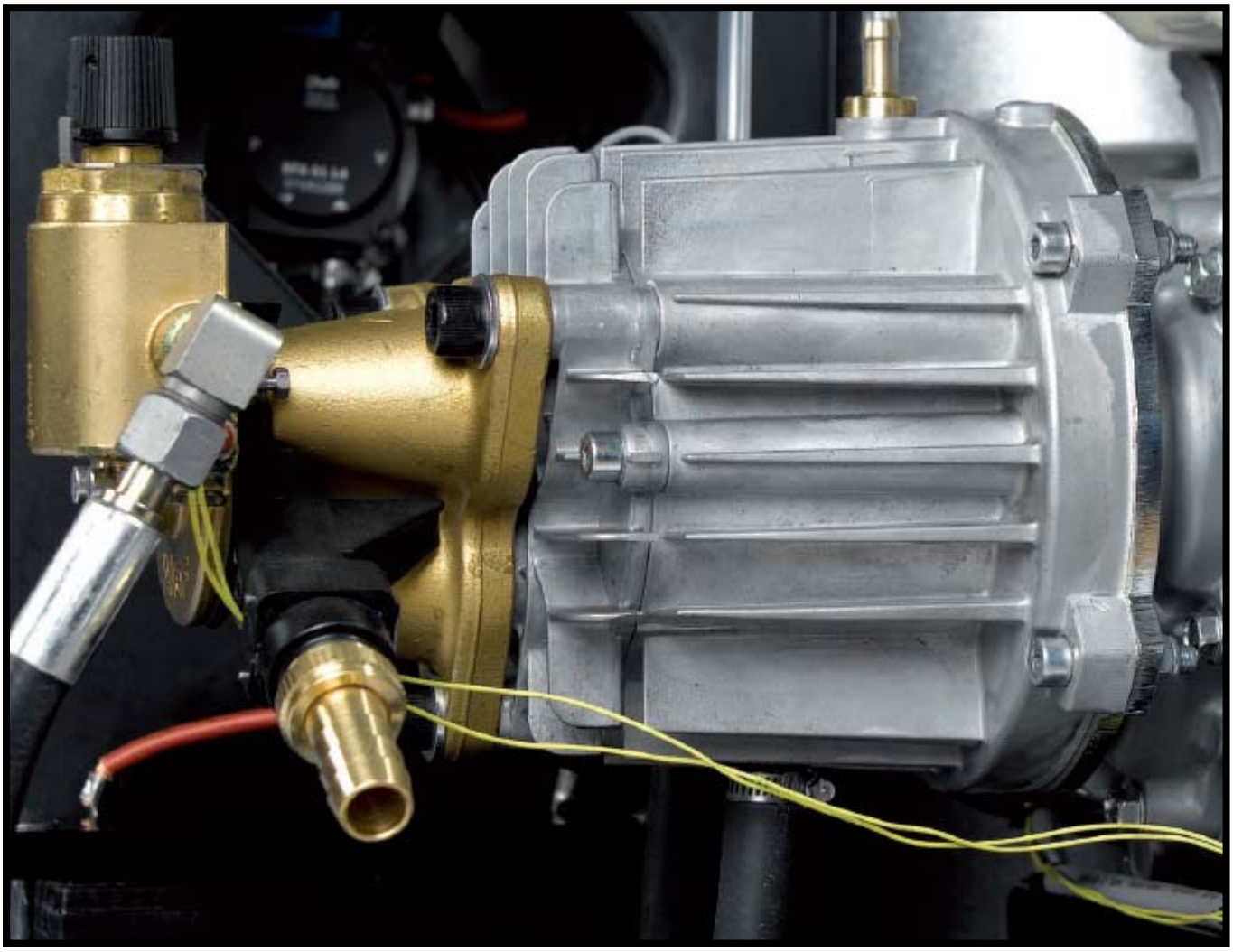
Jetwash Direct ltd

Fault	Cause	Remedy
Green **LED** flashes. 	⇒ Flow sensor fault. ⇒ Water tap closed or water flow inadequate. ⇒ Detergent tank empty. ⇒ Pressure rate control or Vario Press set for too small amount of water. ⇒ Machine scaled up.	• See Chapter F.3.3, F.3.5 and G.3.4."Cold water" mode is possible. • Requirements in Chapter B. • Refill detergent or set the SDR valve to "0". • Set the pressure rate control or Vario Press for a higher water flow. • Descale the machine.
Green **LED** and red **LED** flash simultaneously.  	⇒ Leakage or impermissible operating status through brief operation. ⇒ Spray pistol leaking. ⇒ HP hose, HP coupling or pipe leaking. ⇒ Detergent tank empty. ⇒ Filter clogged in water intake. ⇒ HP pump sucking in air.	• The machine cuts out after being briefly operated three times. **Reset:** set the main switch to "Off". Operate the pistol for > 3 s. • Check the spray pistol. • Tighten the screws, replace the HP hose or pipe. • Refill detergent. • Clean the filter • Correct leaking points.

Fault	Cause	Remedy
Green **LED** and red **LED** flash alternately 	⇒ Motor/machine overheated (MT has triggered).	• Set the main switch to "Off". Allow the machine to cool. • Work without an extension cable or use an extension cable with a larger cross-section. • Possibly a phase failure: have the electrical connection checked.
	⇒ Thermal release B3 has tripped.	• Correct the cause of the fault (Chapter D.2.3.5) and replace the thermal release (Chapter F.7.4).
	⇒	
	⇒ 24 Vac fine-wire fuse F2 has blown.	• Correct the cause of the fault and replace the fine-wire fuse (Chapter F.8.1).
Green **LED** flashes slowly & red **LED** flashes fast 	⇒ Fault in fuel or ignition system, burner fault.	• See Chapter F.2.6 and F.7. "Cold water" mode is possible.
	⇒ Flame probe (option) sooted up.	• If this option is fitted, remove it and clean it.

Fault	Cause	Remedy
Green **LED** does not illuminate. 	⇒ No power to microprocessor.	• Make sure the machine is plugged in. • Operate main switch S1. • Check the primary and secondary voltage (8 Vac) on transformer T1. • Pico fuse F1 has blown (self-resetting). Wait until F1 is reset or, if the fault persists, replace electronic controller A1 (Chapter F.8.1).
Pressure too low.	⇒ HP nozzle worn. ⇒ Pressure rate control or Vario Press set for too low a pressure. ⇒ Flexo Power nozzle open.	• Replace the HP nozzle. • Turn the pressure rate control on the unloader valve in the direction "+", or set the Vario Press rotary knob (accessory) on the pistol for a larger amount of water. • Close the Flexo Power nozzle.
Machine runs jerkily.	⇒ HP pump taking air in from empty detergent tank	• Close the detergent dosing valve. Take the spray pipe off the spray pistol. Operate the spray pistol and let the machine run until the air is expelled from the system and the pump works smoothly.

NA5 Pump



NA5 Pump

Valves

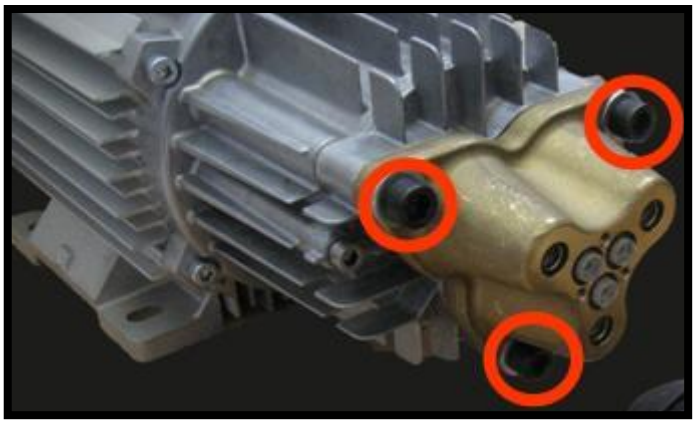


Fig.F.13: Valve housing

- Dismount the valve housing from the cylinder block by the three M12 bolts.
- Be aware of the o-rings and valve parts.

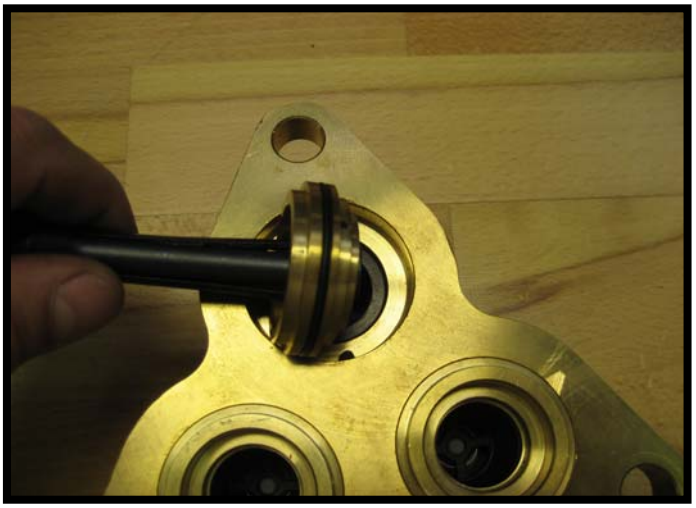


Fig.F.14: Thrust collar

- Be carefull not to damage the surface inside when dismounting the thrust collar.
- Inspect the thrust collar for damages before mounting.

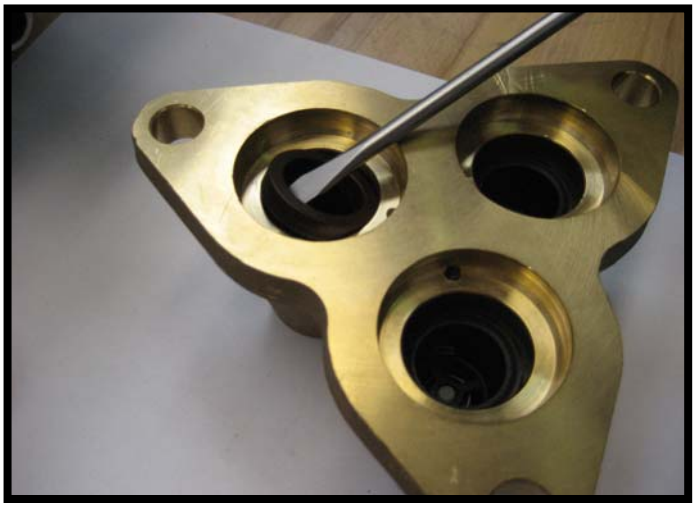


Fig.F.15: Valve housing

- Carefully tip out the sleeves with an adequate screwdriver and replace them. Be careful not to scratch the surface.

Fig.F.16: Valve housing

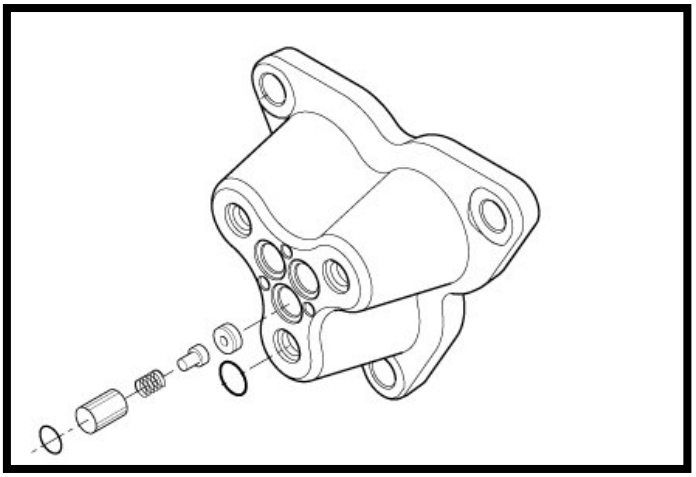
- Knock carefully on the back side of the valve seat to demount it or use an 8mm threaded pin and pull it out.
- Replace with new parts.

NA5 Pump

Valves

Pic. F.17: Suction valves

- Overview of the placement of suction valve parts.



Pic. F.18: Pressure valves

- Overview of the placement of pressure valve parts

Fig.F.19: Pressure valves

- The pressure valves can easily be taken out of the cylinder head.
- Replace with new parts if necessary.

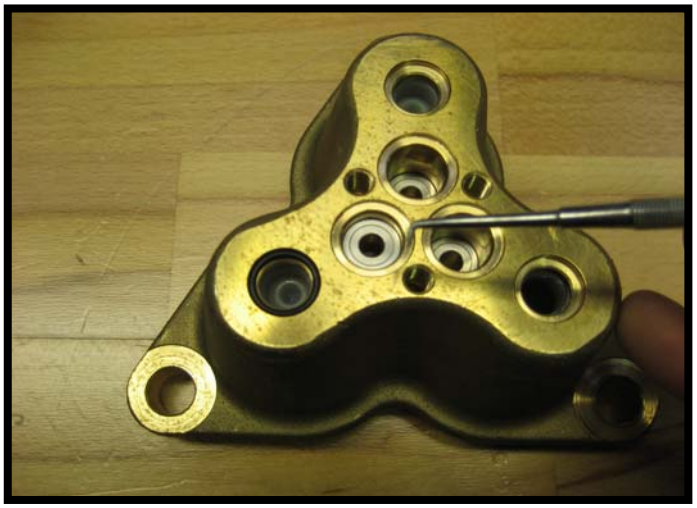


Fig.F.20: Pressure valve seat

- Take out the pressure valve seats with an adequate puller or use an 8mm threaded pin.
- Replace with new parts if necessary.

NA5 Pump

Cylinder Block

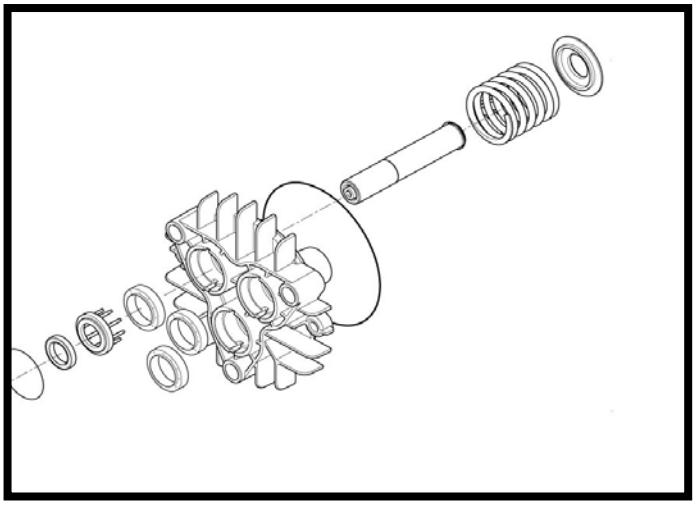


Fig.F.21: Cylinder block

- Overview of the placement of the parts in the cylinder block.

Fig.F.22: Oil Sleeves

- Take out the oil sleeves using an adequate screwdriver.
- Be careful not to damage the surface of the cylinder block.

Oil seal and piston

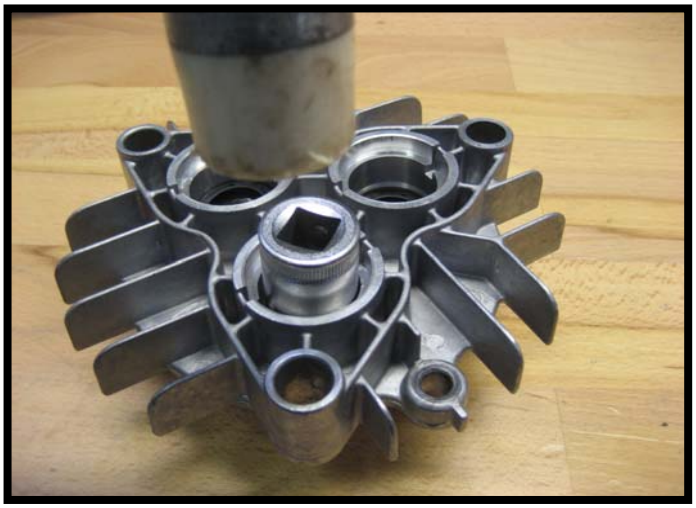


Fig.F.23: Valve Kit 3~ - Exploded View

- To make replacement easier moisten the sleeves with soapy water.
- Mount the sleeves using a 19mm box spanner and a fiber hammer.

Fig.F.24: Pistons

- Place sleeves, pistons and springs as shown.
- Mount the cylinder block to the D-bearing cover by the two 6mm mounting screws.

NA5 Pump

Wobble disc

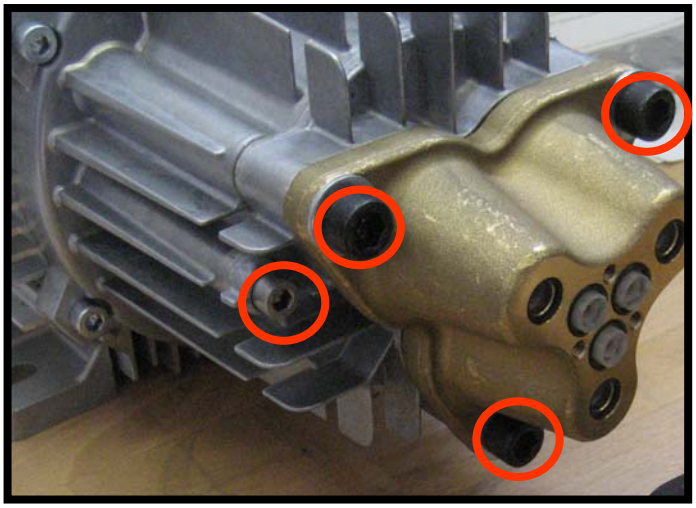


Fig.F.25: Pump head

- The cylinder head and the cylinder block is fastend to the D-bearing cover by two 6mm mounting bolts for the cylinder block and three 12mm bolts for the cylinder head.

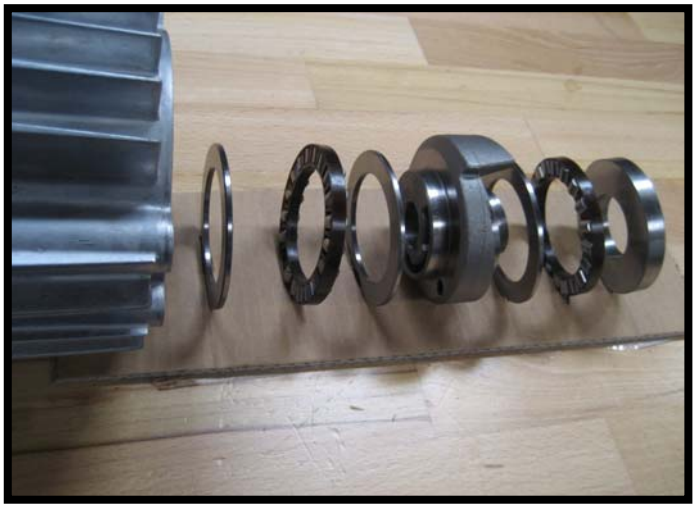


Fig.F.26: D-bearing cover and wobble disc

- Overview of the parts inside the D-bearing cover.

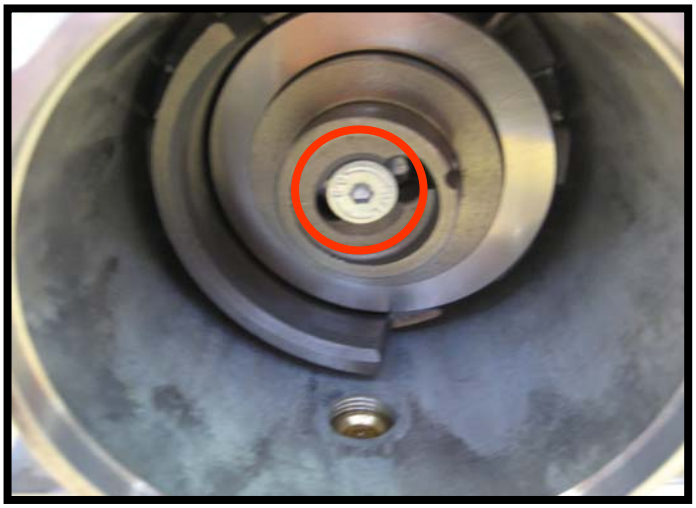


Fig.F.27: Wobble disc

- The center bolt is fixing the wobble disc to the motor shaft and ensure the rotor to be kept in the right position in proportion to the stator.

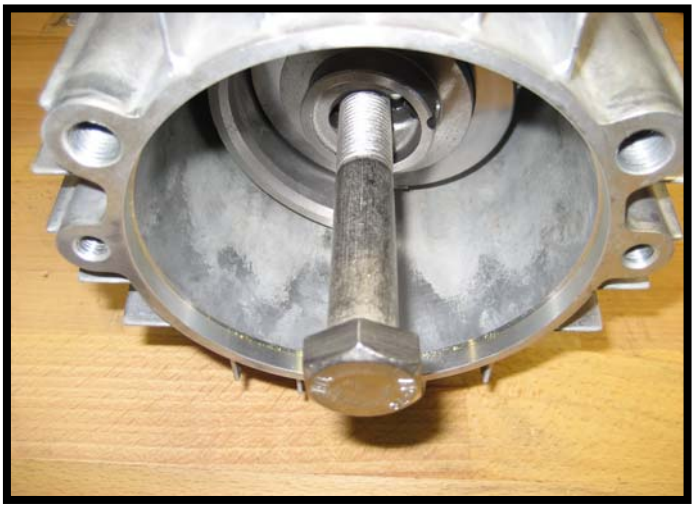


Fig.F.28: Wobble disc removal

- Demount the wobble disc screwing a 1 6mm bolt into the threads. Tighten the bolt against the motorshaft and pull the wobble disc out.

NA5 Pump

D-bearing cover

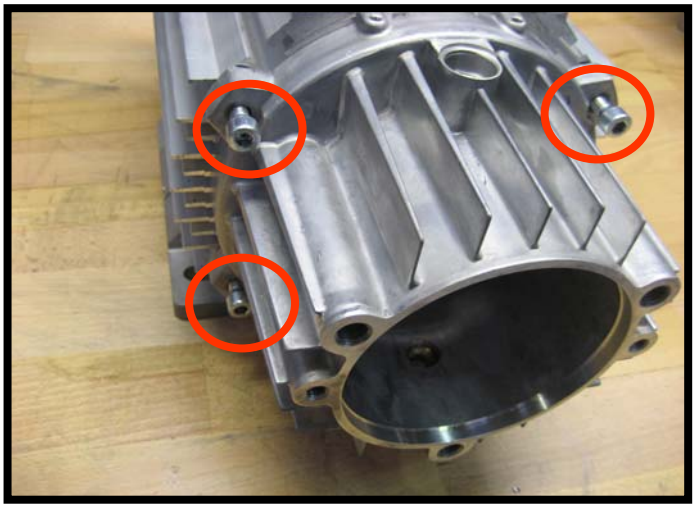


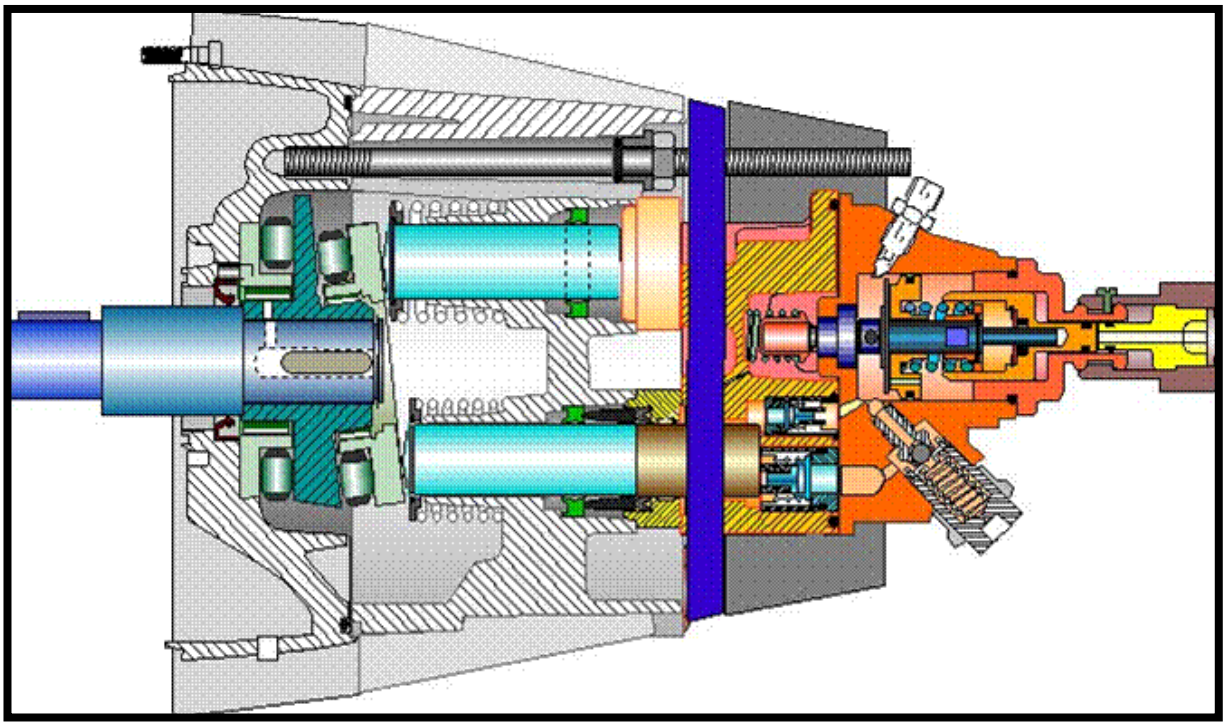
Fig.F.29: D-bearing cover

- The D-bearing cover is mounted to the Motor by four 6mm bolts.
- When the bearing is damaged, always replace the complete D-bearing cover.

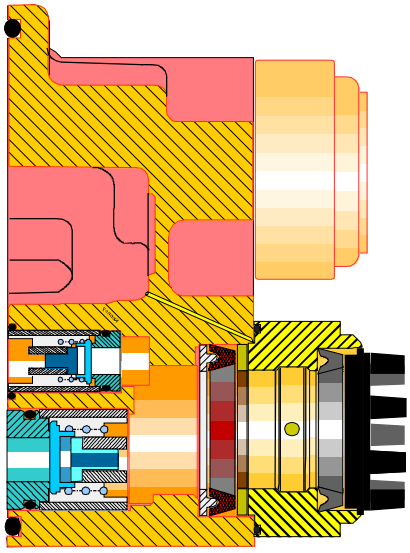
Fig.F.30: Oil sleeve

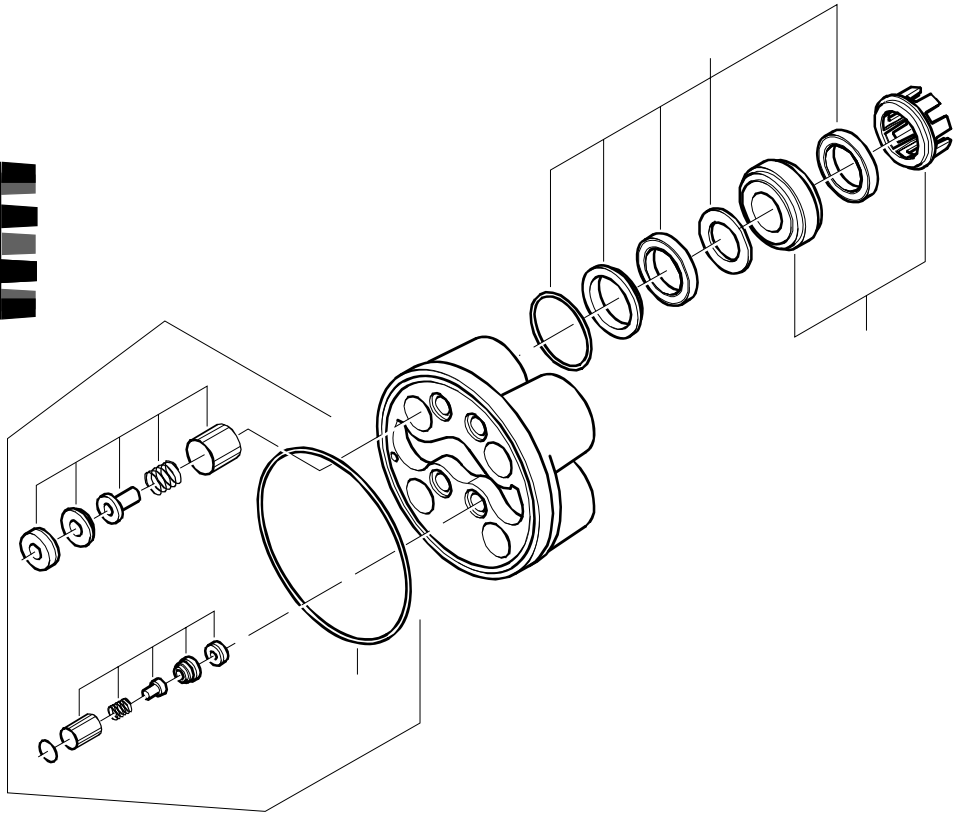
- The oil sleeve in the D-bearing cover can be demounted carefully using a screwdriver.
- Mount the oil sleeve by using an adequate box spanner and a fiber hammer.

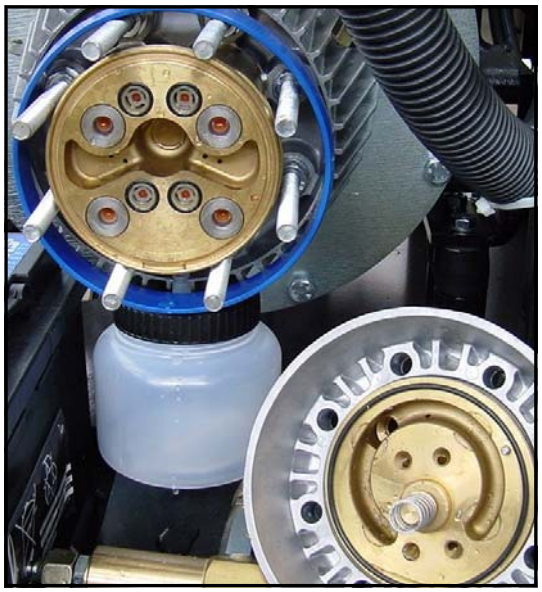
C3 Pump



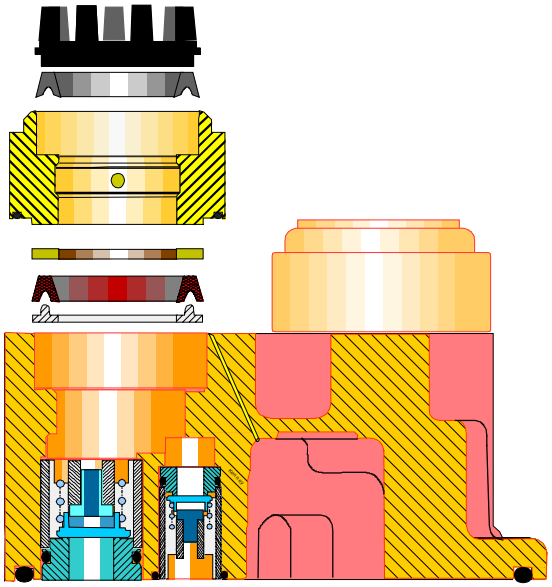
C3 Pump

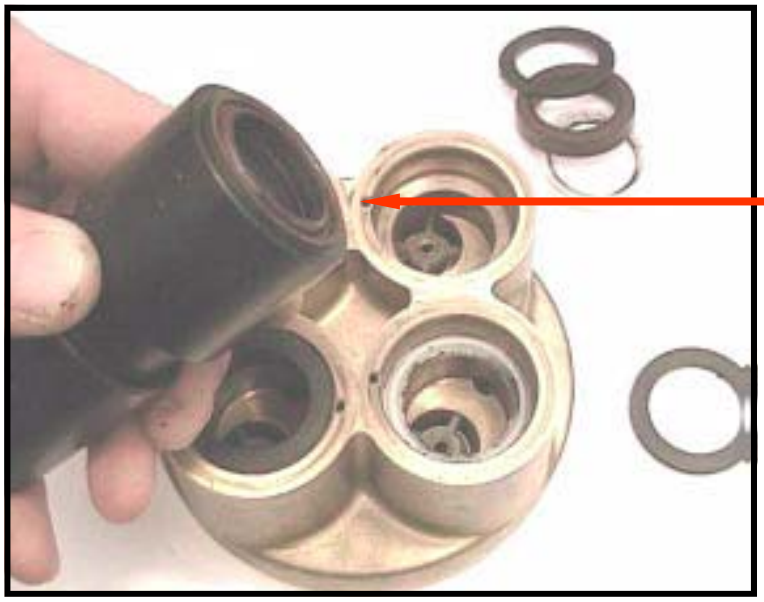






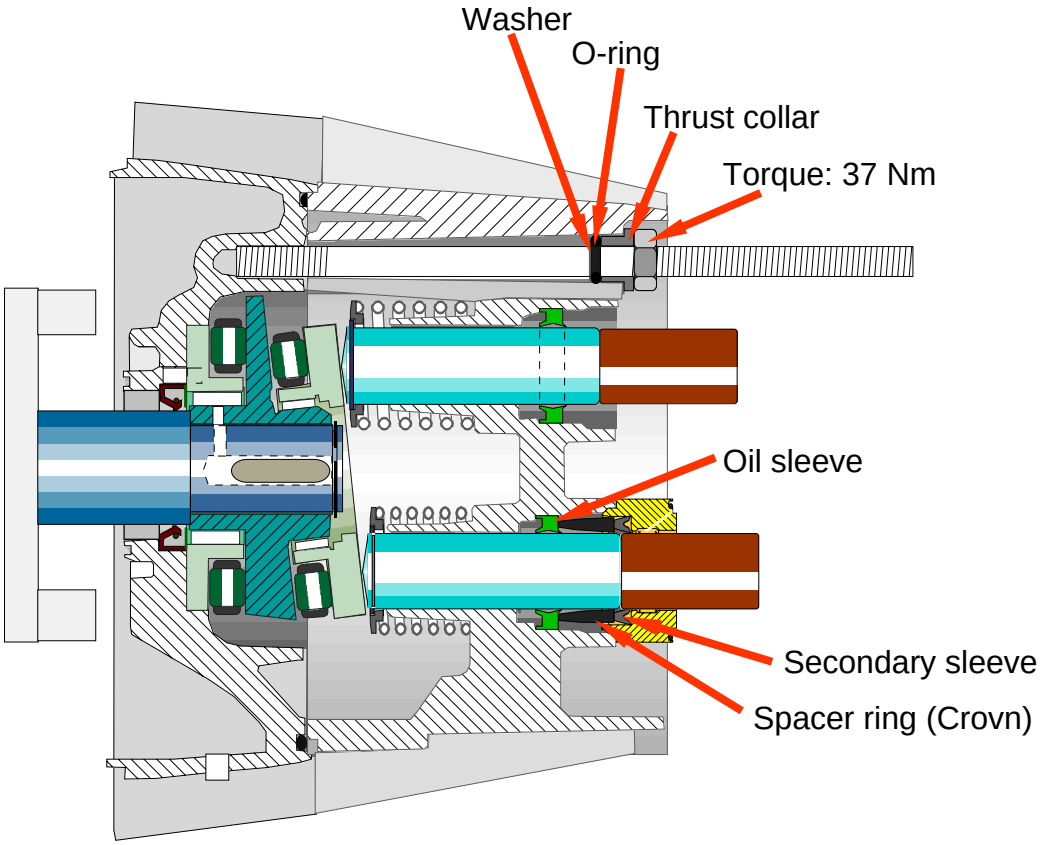
C3 Pump





Mounting of textile sleeves by means of tool no. 1220090. It is an advantage if the sleeves havebeen in a water bath for 3-4 hours before mounting them. Do not forget to blow air through the ducts.

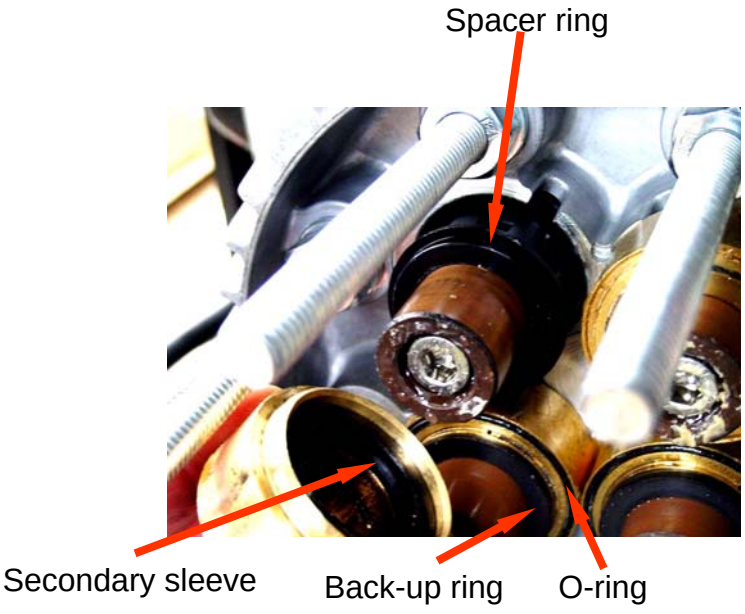
C3 Pump



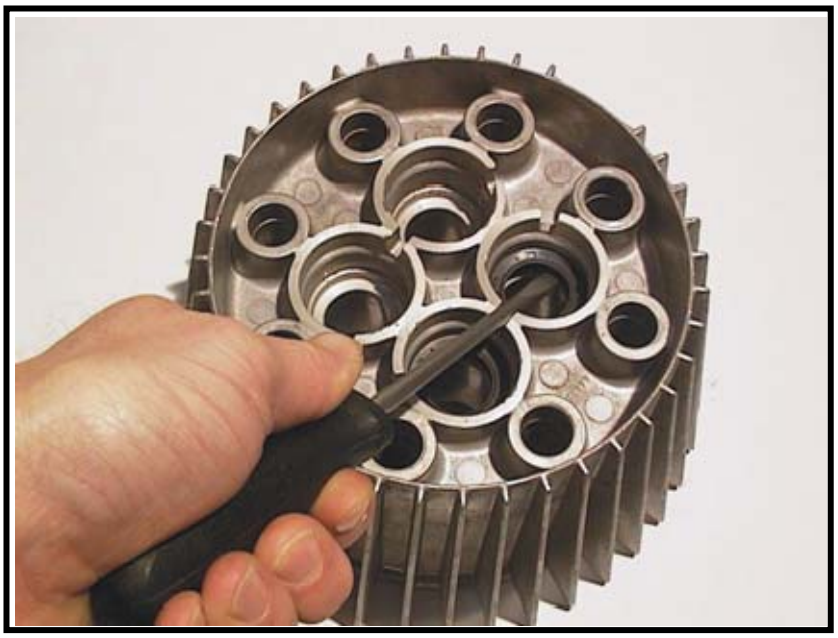
Drain off the oil. Loosen the 8 bolts gradually (because of the spring load). Special box head no.1206762 may be used.

Mount new O-rings on studs with tool no. 1206812.

Always replace secondary sleeves when replacing pressure sleeves. Check that there is a free passage from the drain holes.

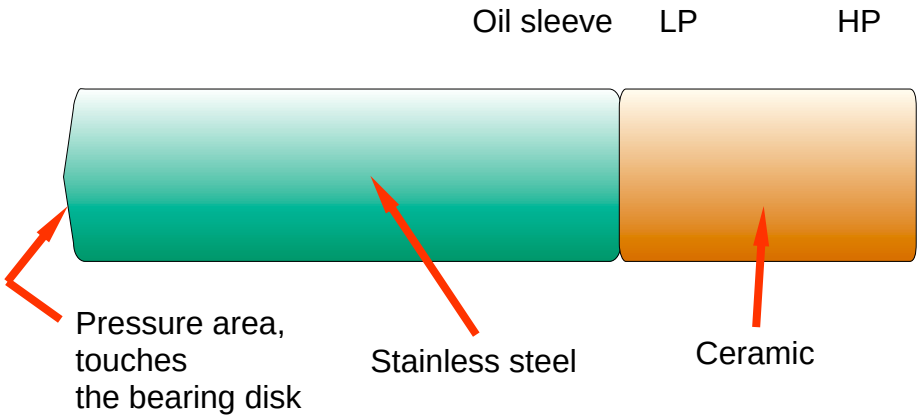


C3 Pump



Carefully tip out the oil sleeves with an adequate screwdriver and discard them. Be careful not to scratch the surface.

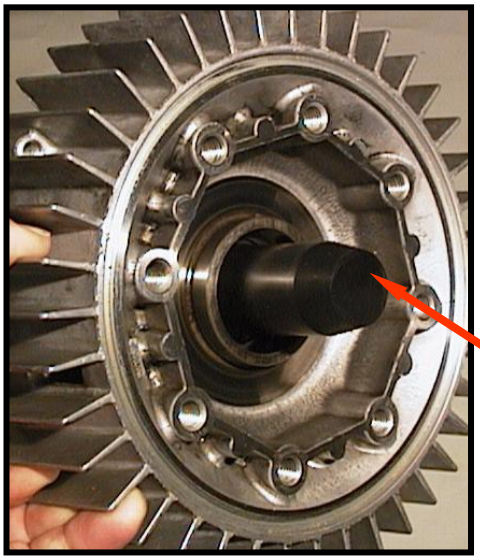
Before mounting the new sleeves, it will be a good idea to moisten the sleeves with soapy water. Mount new oil sleeves with punch no.1220429. Carefully knock or press them home.



Check the piston for wear in the pressure area and the area fPressure area (rides on wobble disc) or oil sleeves. Check the ceramic for cracks. Remove any coating.

C3 Pump

Dismount locking ring on the rotor shaft. The wobble disc is easily dismounted with puller no. 1205715 and special legs no. 1206150/1206168. Do not forget to remove the key before dismounting the D-bearing cover.
Check bearing surfaces for wear. If in doubt, replace kit complete after approx. 2000 hours.



When mounting the D-bearing cover comp-lete,protect the U sleeve with tool no. 1206598 which is placed on the shaft, befo-re placing the cover.

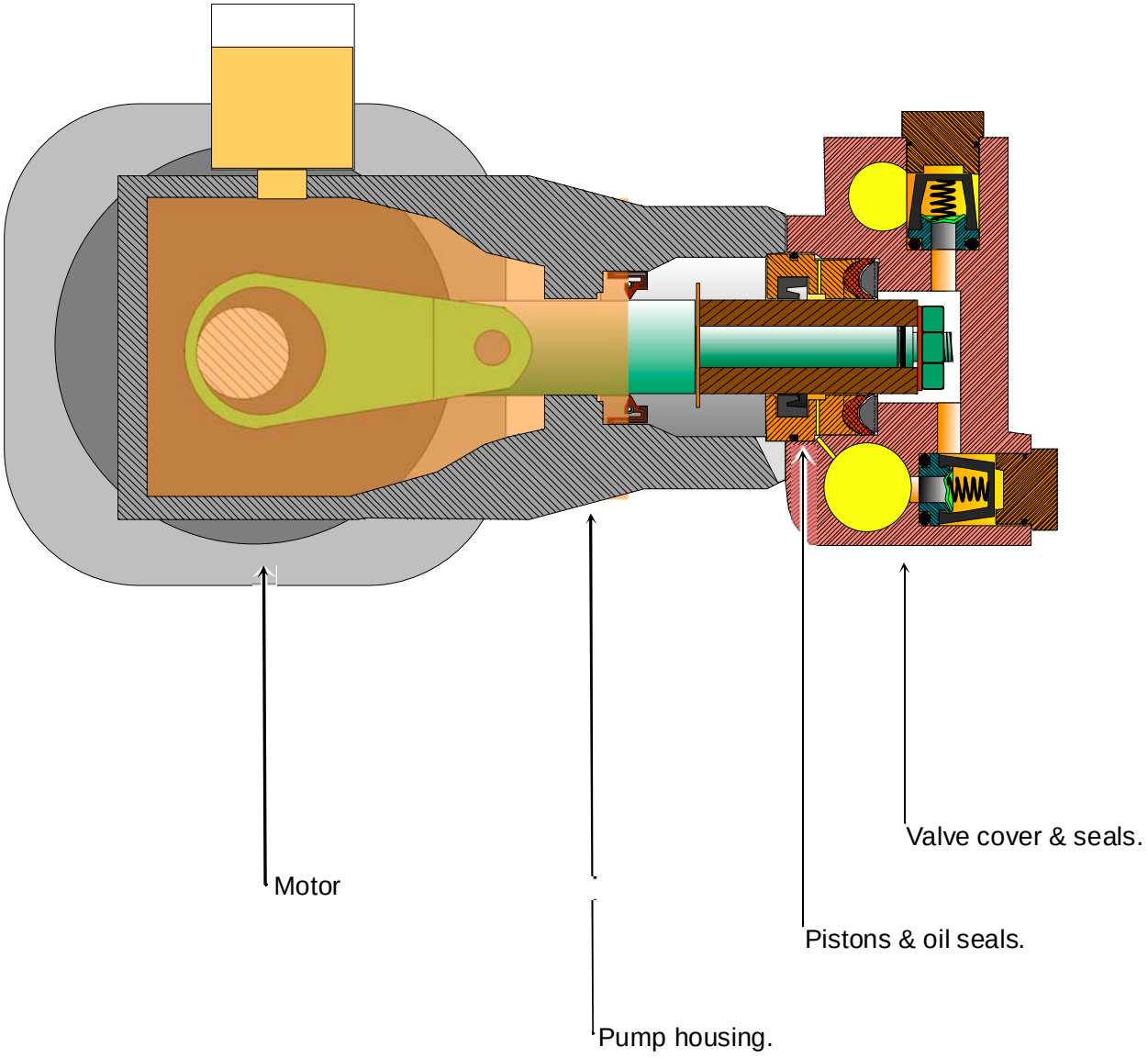
Tool : 1206598

Pittings

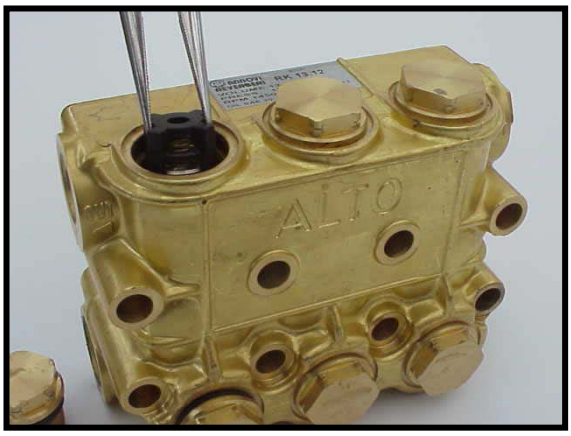
Check the bearing surfaces for wear. As long as the wear is even and shiny without pittings or grooves, the wobble disc can be

When mounting the wobble disc, lubricate the bearings with oil. The big roller bearings are identical. Do not forget to mount the circlip on the rotor shaft. Refill with 1 l oil type Castrol Alphasynt ISO 150.

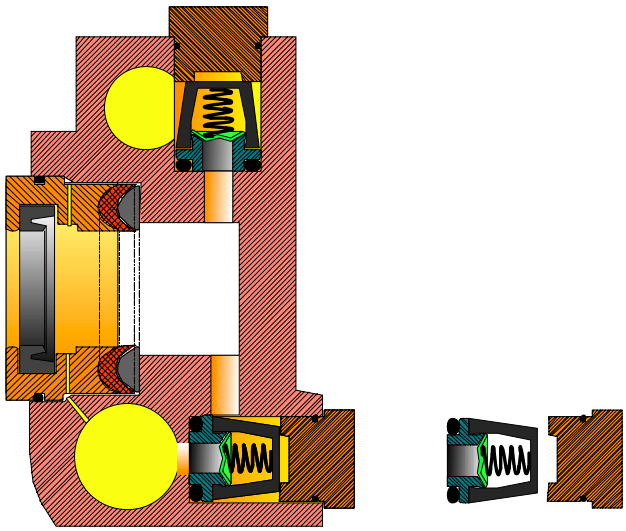
NP5 Pump



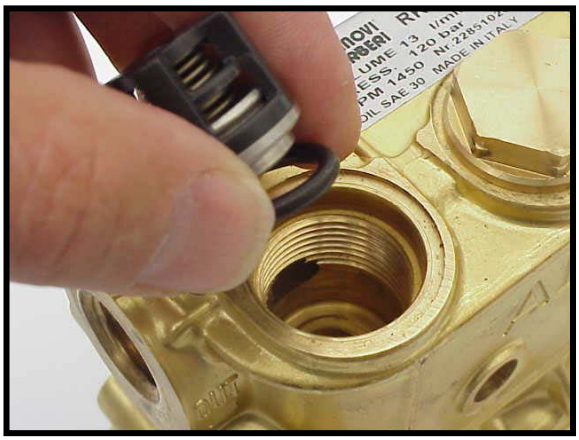
NP5 Pump



Dismount the brass plug on the cylinder head with a 21mm fixed spanner and remove the valves.
Do not scratch the inside of the valve chamber during removal!

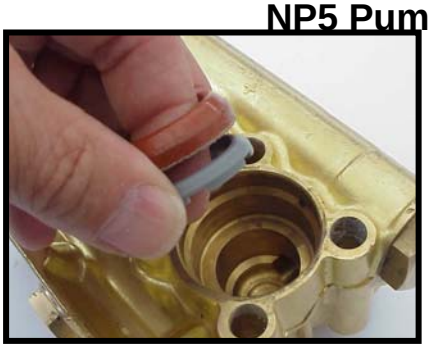


When you replace the valves give the o-rings an inspection for damage before mounting.

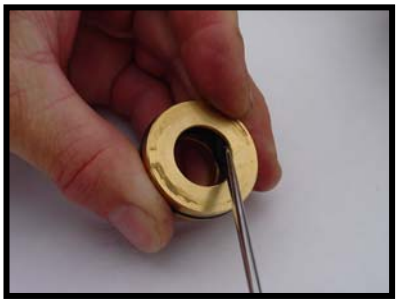


NP5 Pump

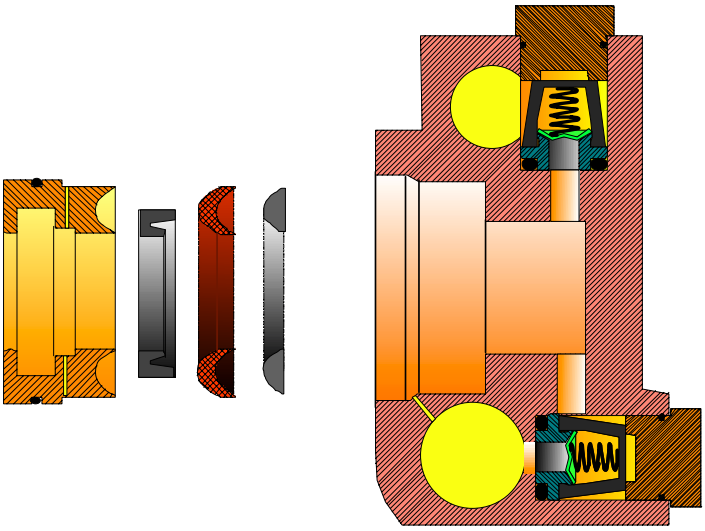
Be careful when you dismount thrust collar because you can easily damage the surface inside. Give the thrust collar an inspection before mounting.

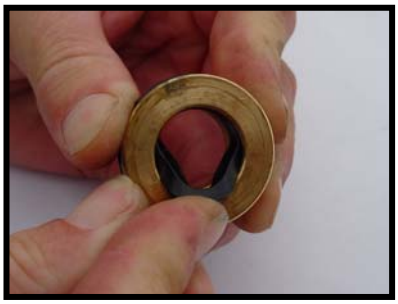


When mounting the sleeves and the spacer, remember lubricating.



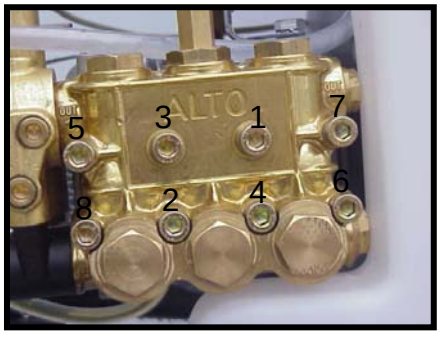
When dismounting the suction sleeves, use a screwdriver to tip out the sleeves. Do not reuse the sleeves.





Clean the thrust collar and lubricate before mounting the sleeves as shown in the ilustration.

Inspect the the thrust collar for marks, lubricate and mount it with your fingers.



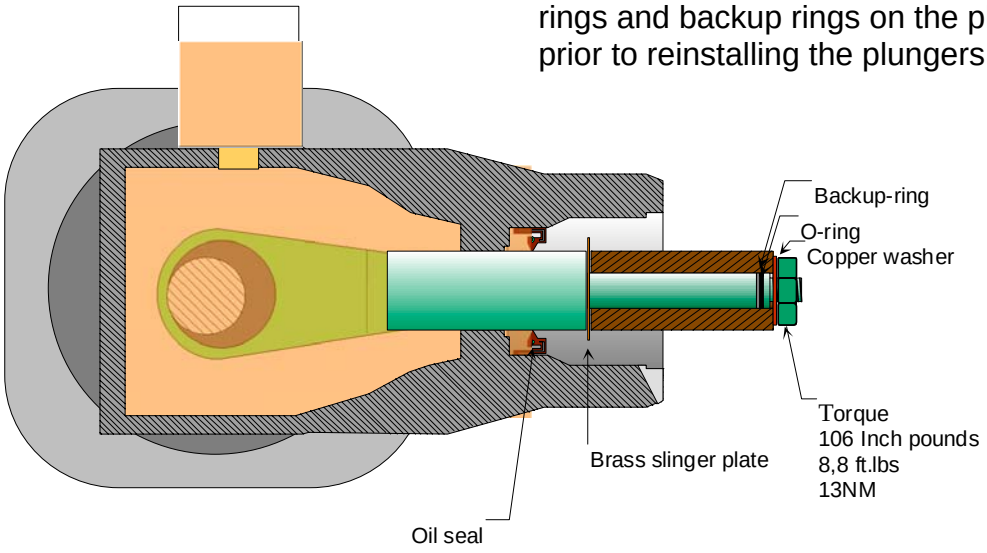
When you mount the cylinder head tighten the bolts in the shown sequence Use a 6mm hexagon wrench.

NP5 Pump

Piston & Oil Seal

To inspect the plunger for cracks. Spray the inside of the plunger with fast evaporating cleaner such as a brake cleansing agent. The brake cleansing agent will take a second longer to evaporate from the crack, thus making the crack visible.

Carefully inspect and replace as needed, O-rings and backup rings on the plunger rod prior to reinstalling the plungers.



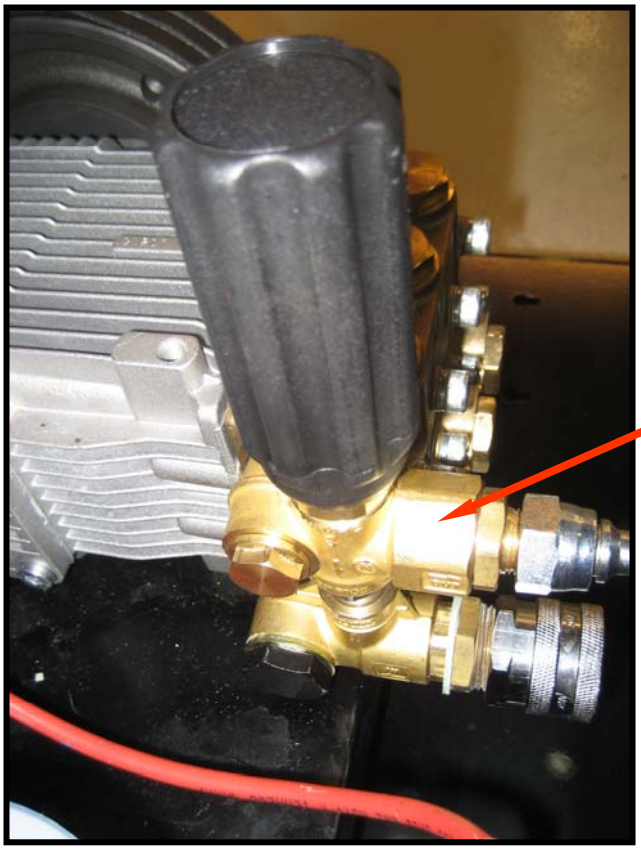
Also clean the brass slinger plates before reinstalling the plungers.

Do not re-use the copper washers!

Use one drop of medium strength thread locker on each plunger rod when reinstalling plunger nut and torque to specifications.

Oil seals must be changed if there any signs of leaks or if they are removed.
The recommended way to remove the oil seals which are pressed into the pump body is to sew the seal with an awl and pry down.
When installing new seals, a light coating of lubricant on the seals may ease the installation.
Make sure it is pressed in using equal pressure around the entire circumference.

NP5 Pump



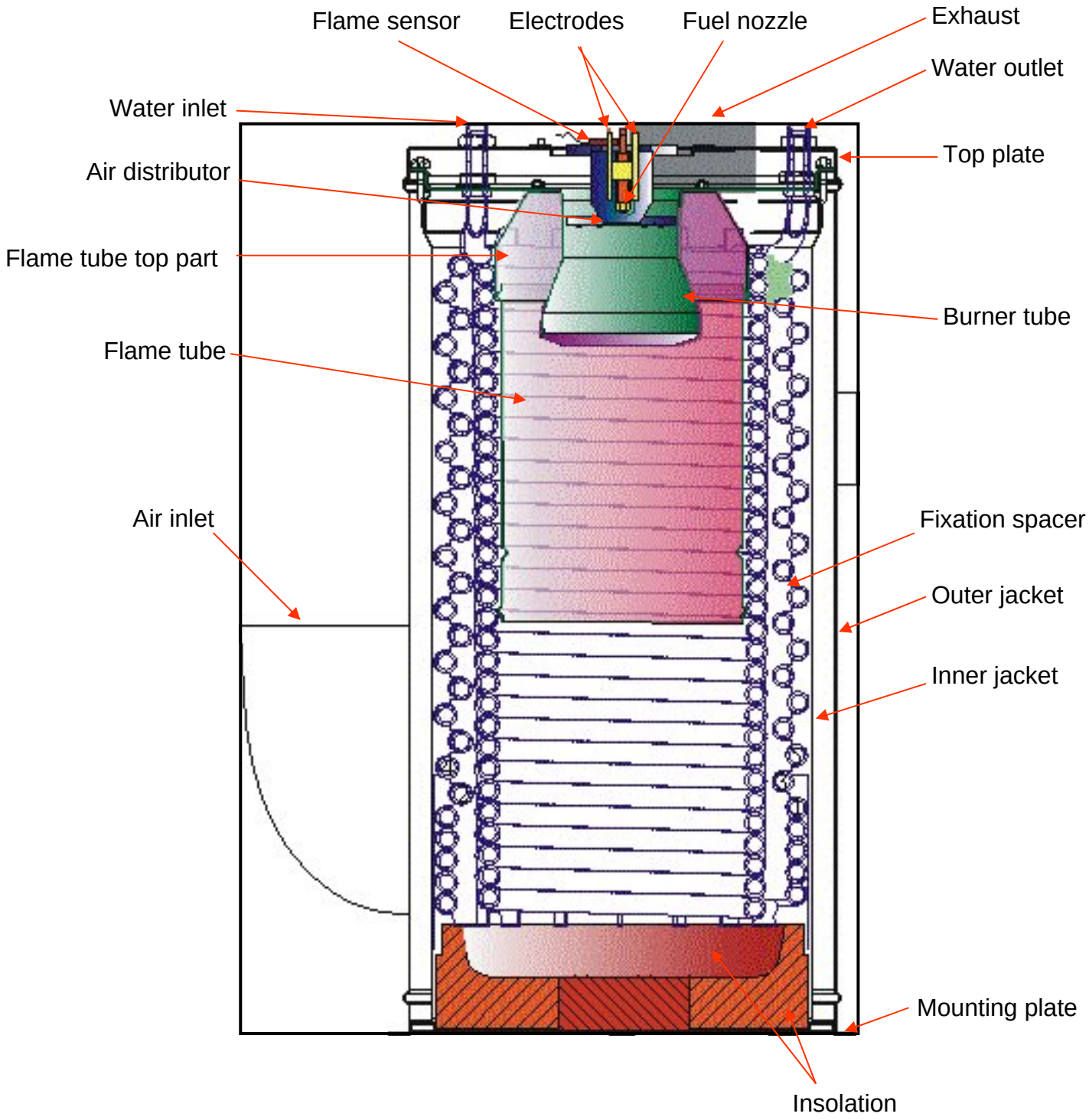
NP5 Unloader valve

NP5 Unloader valve

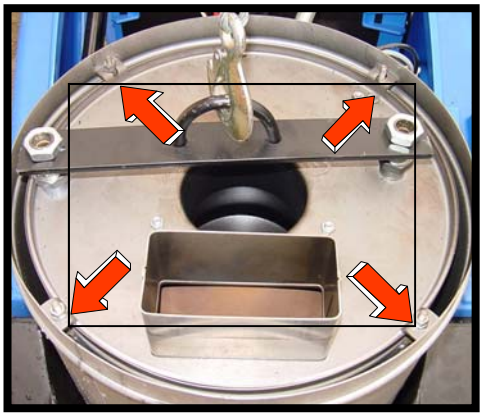
NP5 Unloader valve parts

Boiler

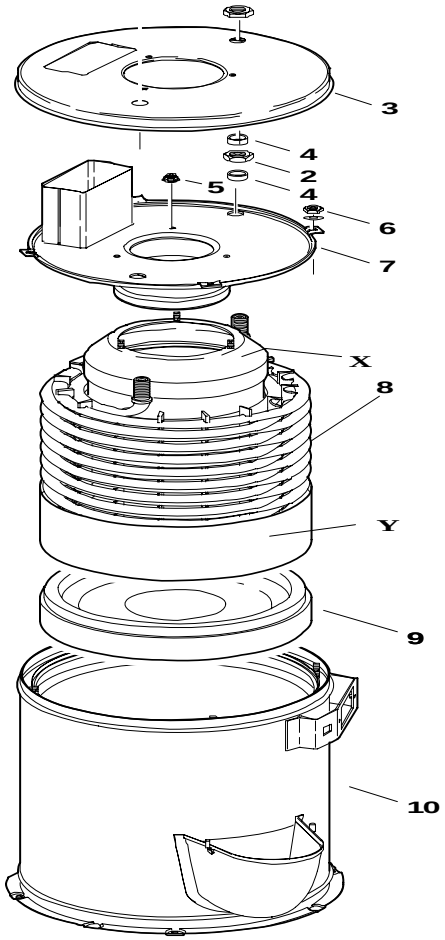
The boiler is the heat generating part of a hot water machine. It consists of a labyrinth-constructed tube coil, which encloses the combustion chamber. The tube coil is enclosed by a double container with boiler jacket, bottom, and top in a sandwich construction, between which the combustion air is routed into the combustion. An insulating material placed in the bottom of the boiler makes sure that the inner bottom, among other things, is protected from superheating.



Boiler



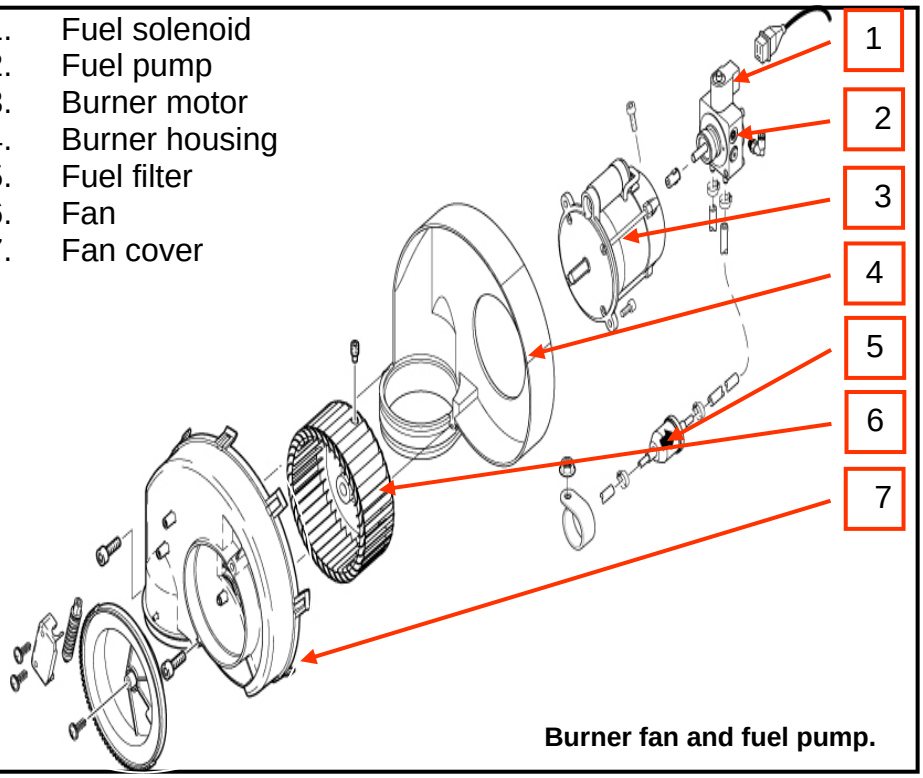
Remove the outer top cover and mount the lifting tool over the two coil ends and fix it with the nuts. Dismount the 4 nuts "Arrows"and hook up the crane and lift out the coil.



Check the flame tube marked with X and Y. It is important that they are solid and complete.
Y is a part of the coil 8 and cannot be separated.
Clean the coil.

Burner Unit.

1. Fuel solenoid
2. Fuel pump
3. Burner motor
4. Burner housing
5. Fuel filter
6. Fan
7. Fan cover

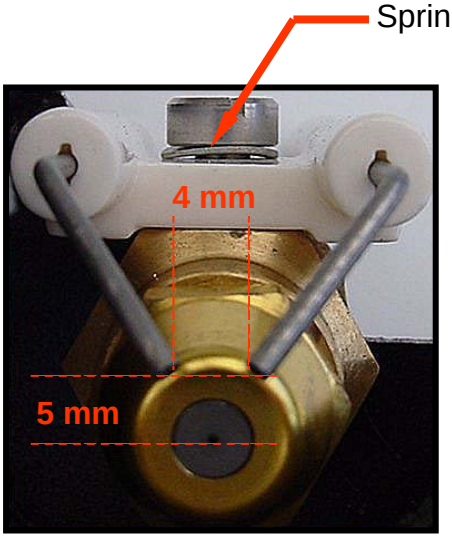


Burner fan and fuel pump.

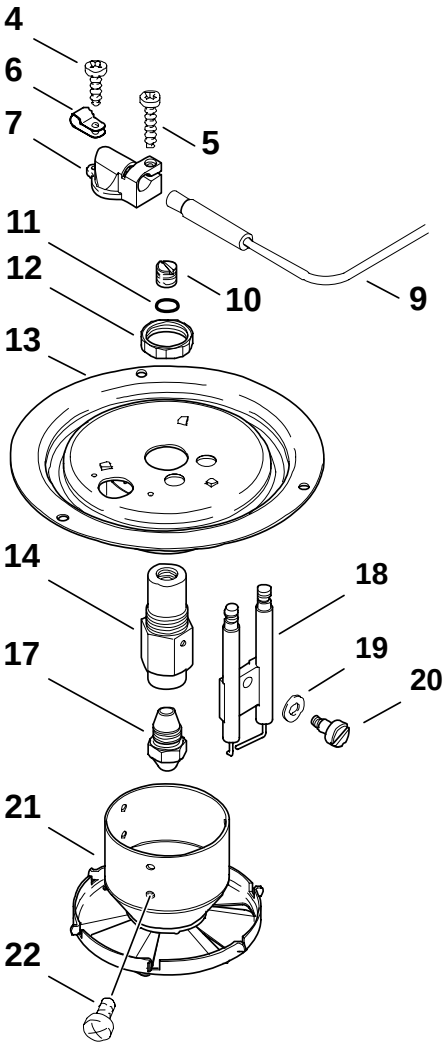
Clean up deposits and change the isolation if needed.

Burner Electrodes

Electrodes



The electrode is adjusted from factory. If the distance between the legs becomes greater than 4 mm, the electrode must be changed.
The electrode 18 is self adjusting the position on the nozzle by a spring washer 19 under the fixing screw 20.



The flame sensor 9 must be fixed with 5 in the right position.
Clean the flame sensor

Maintenance plan

	Weekly	NP 5 pump only: After the first 50 operating hours	C3 and Na5 pump every six months or 500 operating hours	As required
Water filters				●
Oil filter				●
Checking the pump oil quality	●			
Changing the pump oil		●	●	
Emptying the fuel oil tank				●

IMPORTANT:
When torque settings are made, all parts — Pump, screws etc. must have a temperature at 20°C.

NA5 pump

Torque specifications

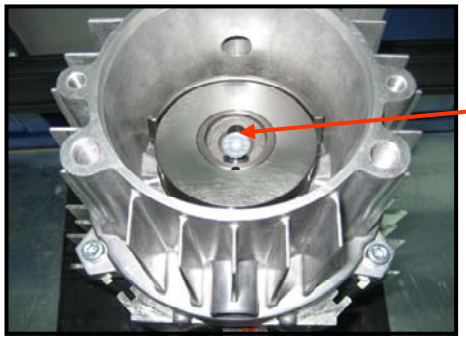


Fig.G.01: Wobble disc

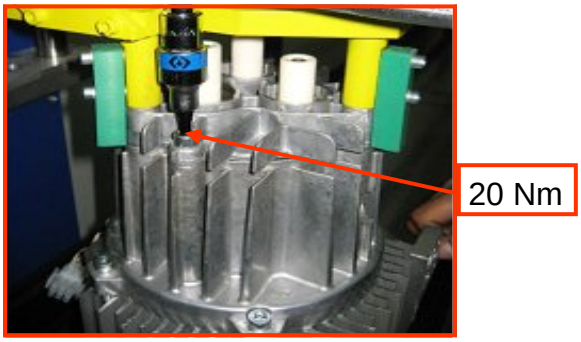


Fig.G.02: Cylinder block

Fig.G.03: Cylinder head

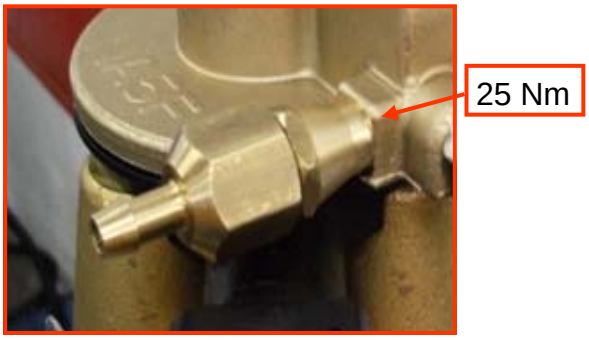


Fig.G.04: Venting valve

Fig.G.05: By-pass housing

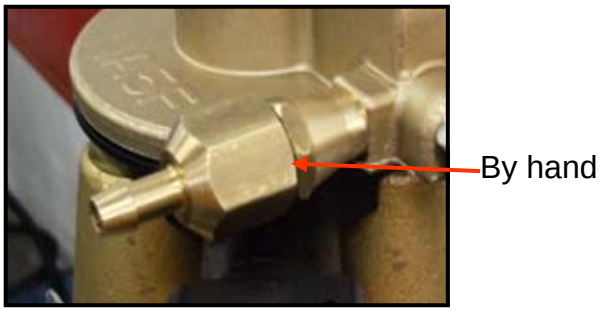


Fig.G.06: Venting valve

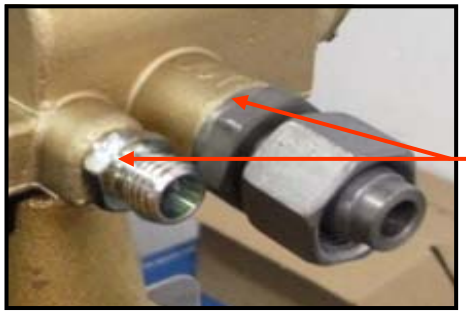


Fig.G.07: Outlet fittings

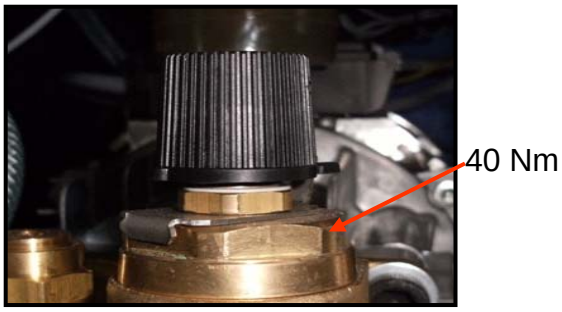


Fig.G.08: Water regulation

NA5 pump

Adjustment of by-pass system.

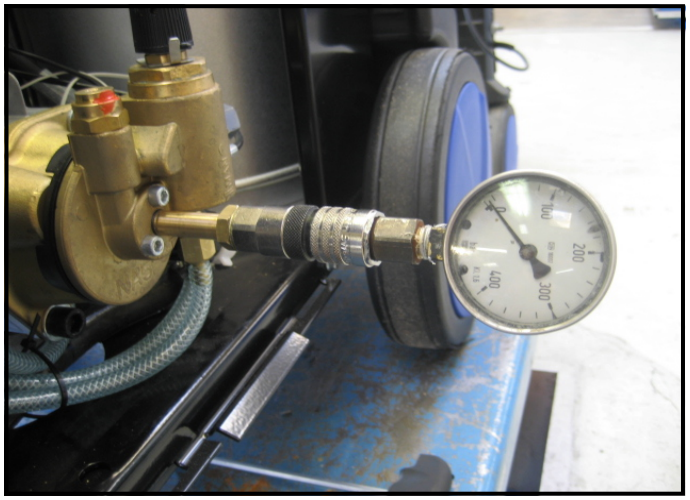


Fig.G.09: Pressure gauge

Dismount the test plug in the by-pass housing and mount a pressure gauge instead.

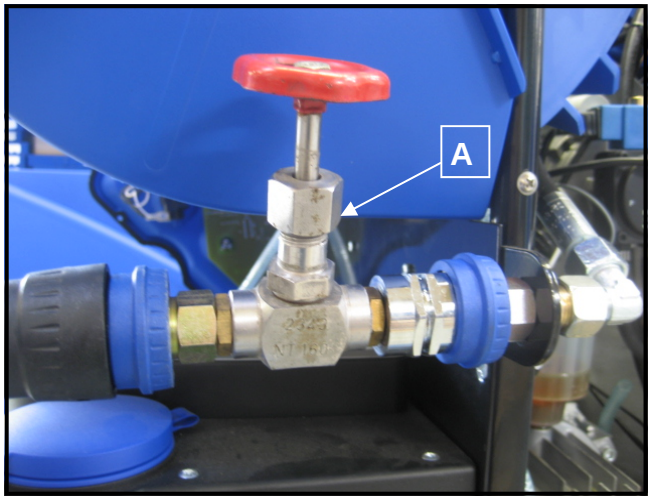


Fig.G.10: Test tap

Connect a test tap (A), hose and pressure gun to the outlet of the machine.

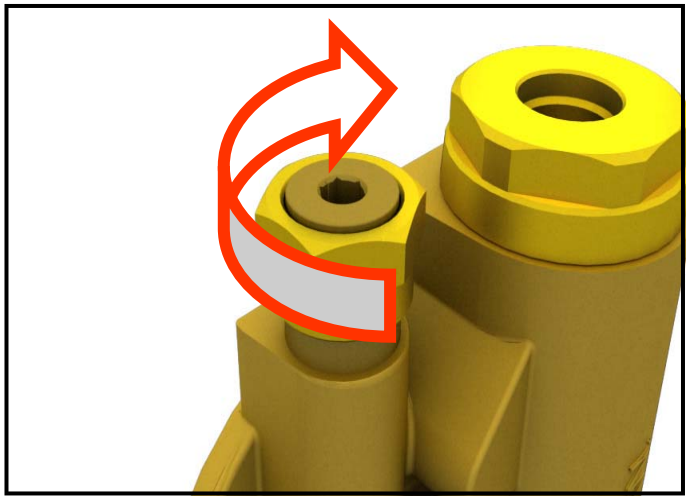


Fig.G.11: Safety valve

Close the safety valve completely.

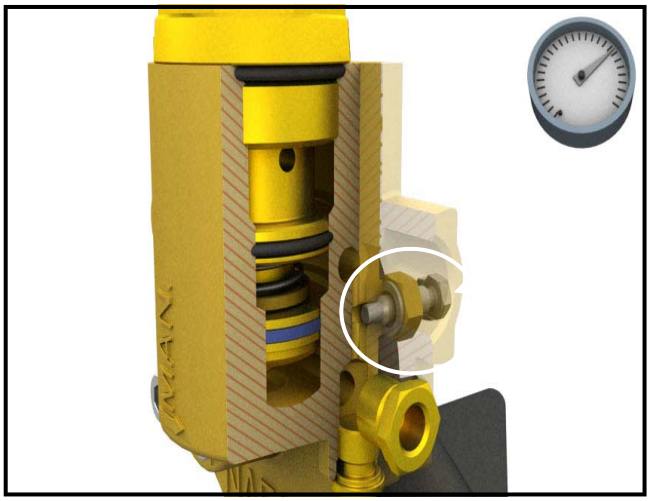
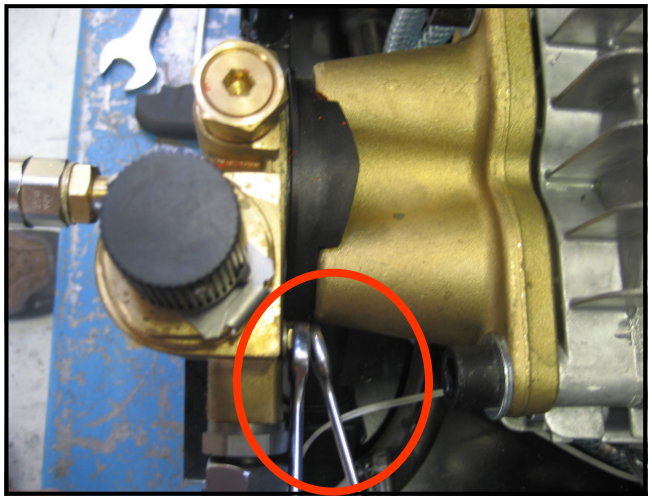


Fig.G.12: Pressure bolt

Adjust the test tap (A) and the pressure bolt (B) so it couples 20-30 bars higher than working pressure, when the pressure gun is closed— CUT OFF PRESSURE. After the cut off pressure is reached the machine runs in by-pass untill the pressure gun is opened.
The working pressure is stated in the technical data sheets chapter B.

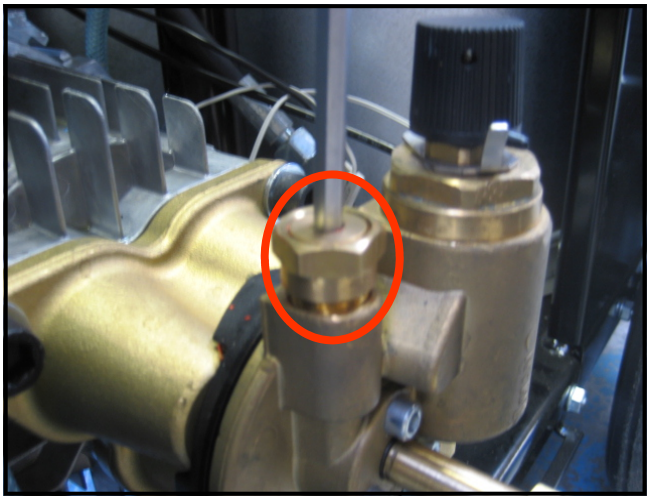
NA5 pump

Adjustment of by-pass system.



Pressure bolt

When adjustment is done, lock the bolt with the counter nut.

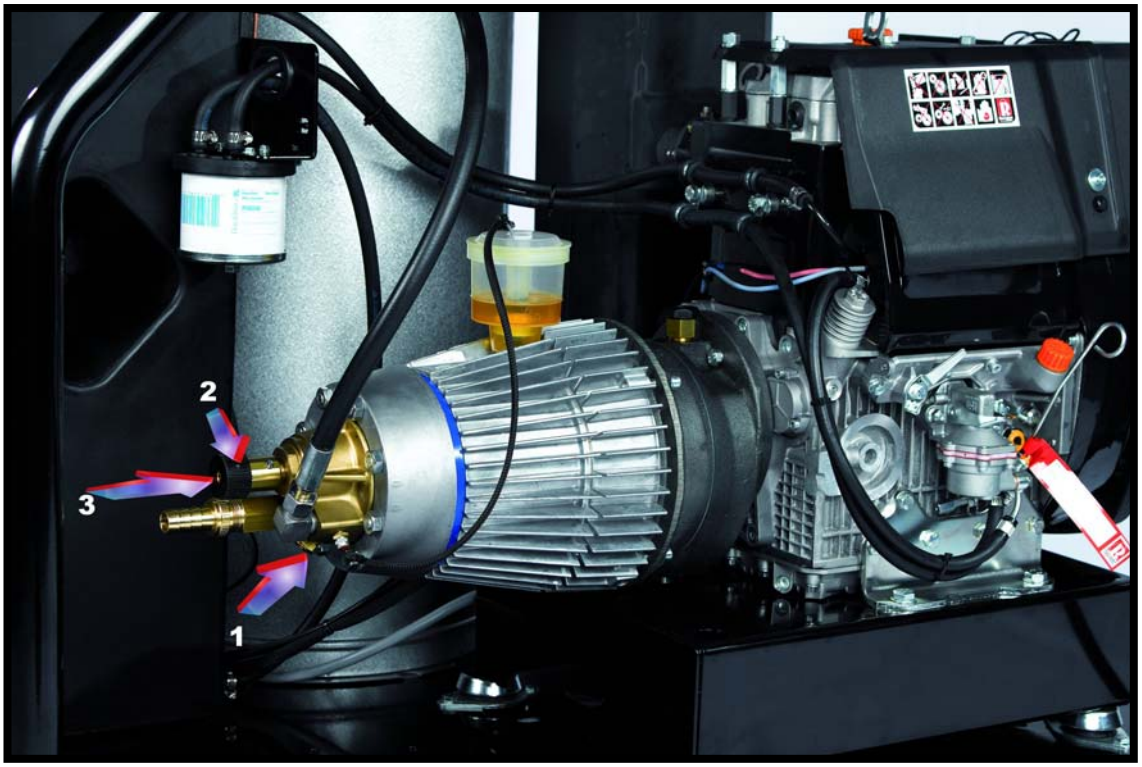


Safety valve

Then let the machine run just below the cut off pressure (working + adjustment) and adjust the safety valve out until it couples out (go into bypass). Then you adjust the adjusting “screw” a ½ turn back and lock it with the counter nut.
Finalize the adjustment with locking glue/ paint on both the bolt and the safety valve.

C3 pump

Adjustment of by-pass system.



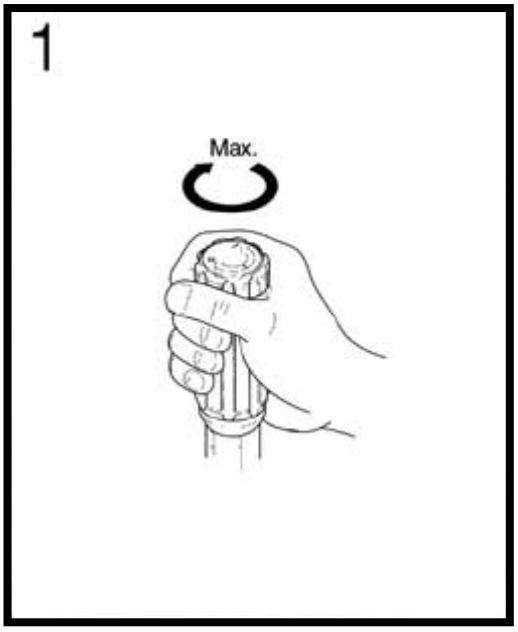
Pos. 1 Safety valve adjustment
Pos. 2 Set screw for min. Water adjustment
Pos. 3 Min. Water adjustment screw

Minimum water volume (and pressure) adjustment:
First mount test manometer with correct high pressure test nozzle.
Turn the black handle on the water regulator all the way clockwise. (Min. Water volume)
Start the motor and run at full RPM.
Test manometer must show approx. 30 bar. If this is not the case, loosen set screw (pos. 2), and then turn the min. Water adjustment screw (pos. 3) untill you reach approx. 30 bar.

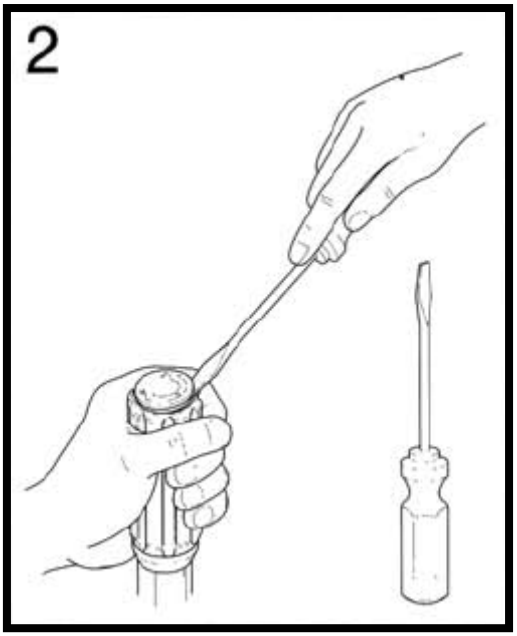
Safety valve adjustment:
First mount test manometer without test nozzle—just open outlet.
Turn the black handle on the water regulator all the way counterclockwise. (Max.. Water volume)
Start the motor and run at full RPM.
Slowly close the valve on the test manometer, and read the pressure when the safety valve opens. (That will be the pressure just before the pressure drops)
The opening pressure for the safety valve must be 25-30 bar above normal working pressure.
To adjust the opening pressure, loosen the lock nut (pos. 1) with a 22 mm Open/ring spanner.
Then adjust the safety valve by turning the adjustment screw with a 6 mm. Allen Key, When turning clockwise—opening pressure increases, and counterclockwise it decreases.

NP5 pump

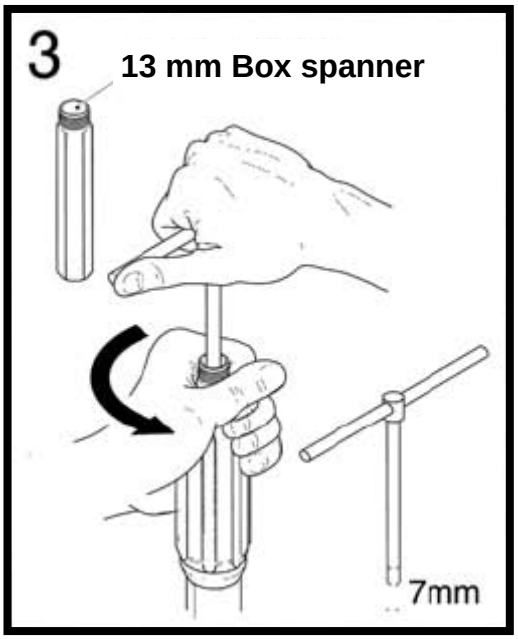
Adjustment of Unloader system.



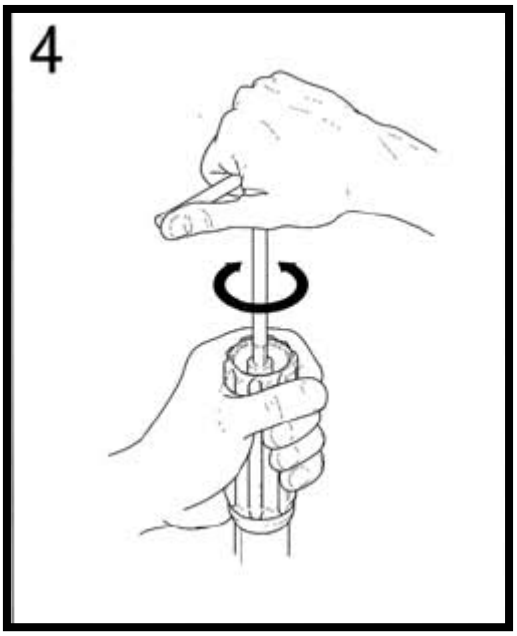
Turn the black handle clockwise as far as it can.
This is max. pressure adjustment.



Using a screwdriver or similar tool, to remove the cap on top of the unloader.



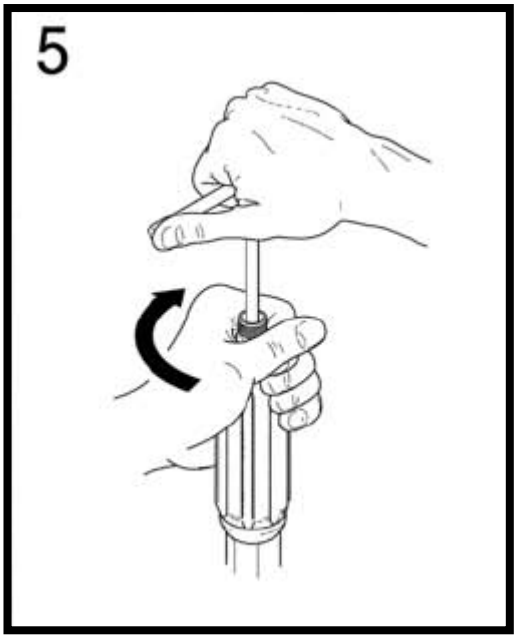
Loosen the lock nut on the pressure adjustment bolt. Use a 13 mm. box spanner.



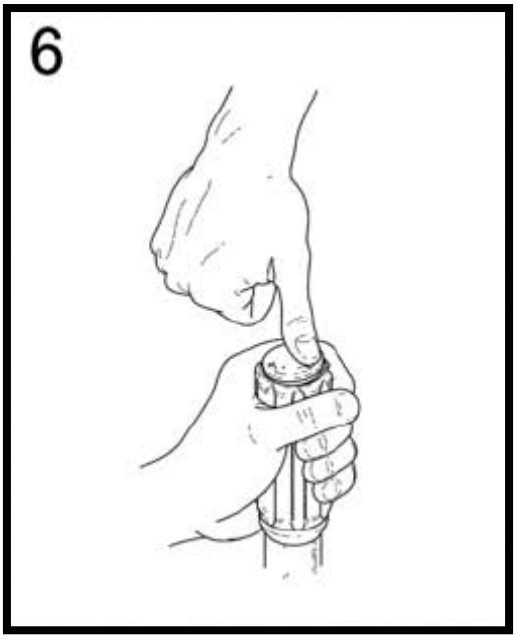
Adjust the pressure with a 7 mm. Hexagon Allen Key the following way.
Start machine with correct HP nozzle.
Loosen unloader until pressure drops, then turn ½ turn clockwise, to obtain full pressure again.

NP5 pump

Adjustment of Unloader system.



When the correct pressure is adjusted, tighten the lock nut with a 13 mm. Box Spanner.



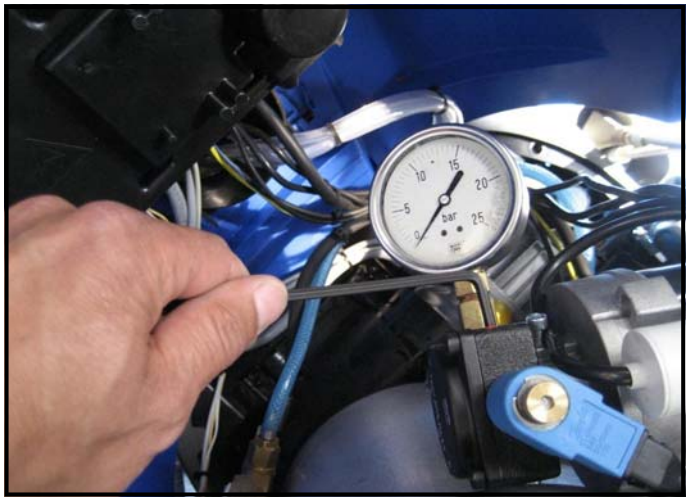
Mount the cap on top of the unloader. Now the correct adjustment of the unloader is done. By turning the handle counterclockwise, you can reduce the pump water volume and pressure.

Burner settings.

Note: Higher CO2 concentrations at different barometric pressure, altitude or temperature and poor quality of the used fuel can lead to faster soot deposition on the heating coil of the heat exchanger.

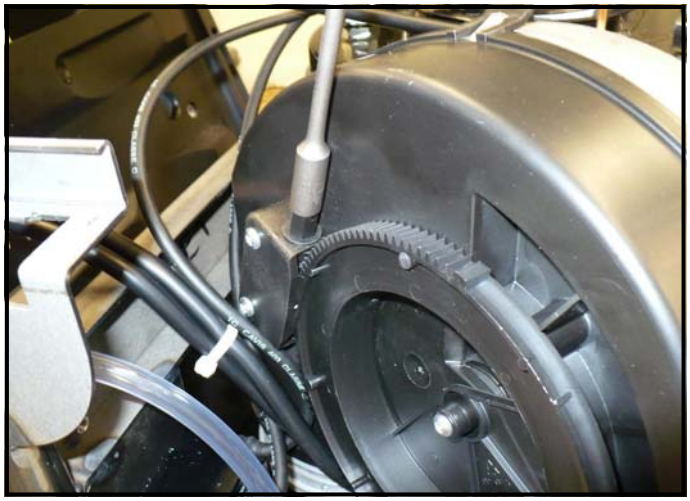
Preparation
1. Set the fuel pressure.
2. Let the machine run in "Hot water" mode for at least two minutes so that it reaches operating temperature and meaningful results can be measured.
Note: Machines that are primarily used for a brief period should run continuously for about half an hour in "Hot water" mode before an exhaust measurement.

Measurement
3. Determine the soot rating with a soot pump and soot rating reference scale. The figure should not exceed "1". Otherwise, open the air flap a little and repeat the measurement. Repeat the procedure until the specified value is obtained.
.
4. Then the CO2 content in the exhaust, the intake and exhaust temperature are determined. This can be done with conventional meters or with an electronic meter like the TESTO 325, which measures and displays all relevant data.
If the measured value is too low, close the air flap a little and check the soot rating and Co2 content again.
Repeat all settings until all specified values are obtained.
5. Finally seal the set screw (arrow A) of the air flap with varnish.



Fuel pressure setting.

- Mount pressure gauge on the fuel pump.
- Adjust the fuel pressure according to the values in Technical data chapter A.



Air flap.

- The air flap on the side of the burner fan is adjusted by a self-locking spindle on a set screw. Turning clockwise increases the air intake, turning counterclockwise reduces it.

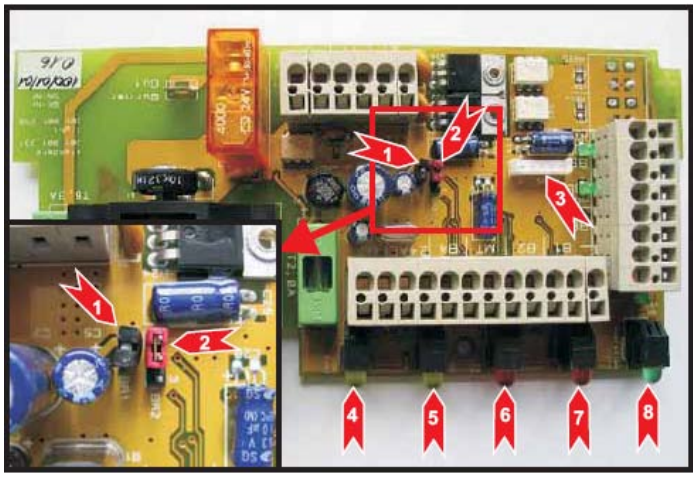
Burner settings.

Fig.G.17: Soot raiting

Determine the soot rating with a soot pump (1) and soot rating reference scale. The figure should not exceed "1". Otherwise, open the air flap (Fig.G.07) a little and repeat the measurement. Repeat the procedure until the specified value is obtained.

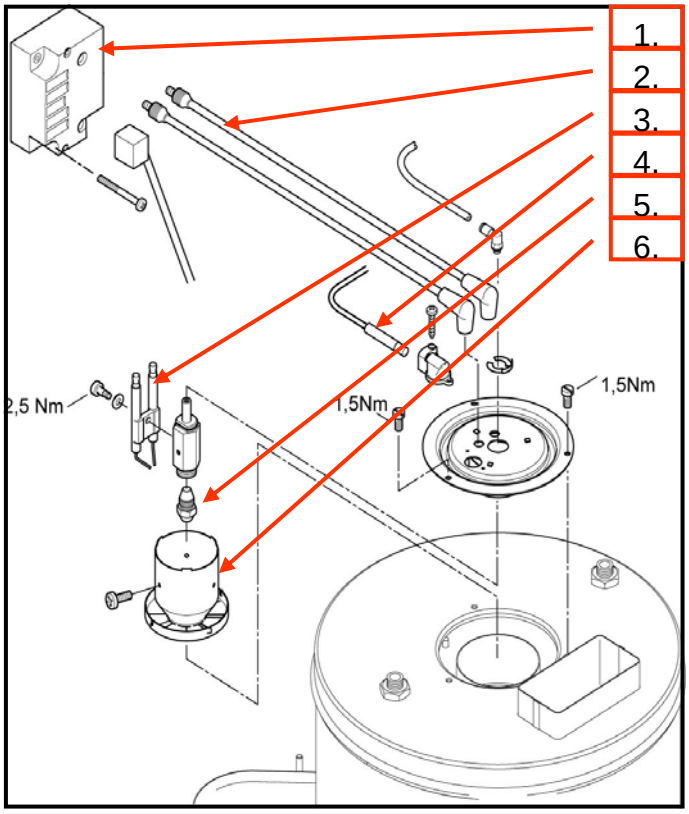
Fig.G.18: Burner measurements.

The CO2 content in the exhaust, the intake and exhaust temperature are determined. This can be done with conventional meters or, as in Fig. G.08, with an electronic meter like the TESTO 325 (4), which measures and displays all relevant data.
If the measured value is too low, close the air flap (Fig.G.06) a little and check the soot rating and Co2 content again.



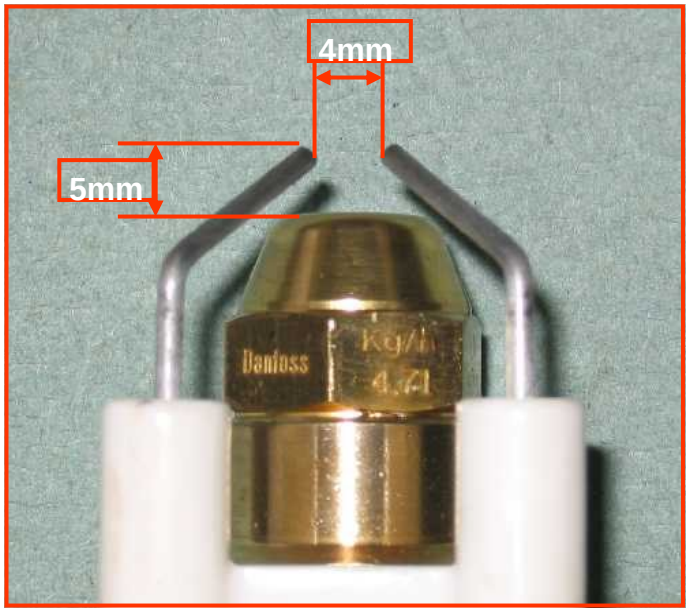
1. BR1
2. BR2
3. X5—For Datalogger and Service Interval
4. ”Fuel” LED
5. ”Antistone” LED
6. ”Service” LED
7. ”Pump Oil” LED
8. ”Operation” LED

Service time setting:
Switch off machine with S1. install a jumper on X5 between pin 3 and 5. Switch on machine (cold water mode). With the temperature setting knob it is now possible to set a new service interval. The reading is done by the LED’s (4,5,6,7 and 8), where (4) is 100 hours, 4+5 is 200 hours and so on, up to 500 hours when all LED’s are on. If setting is not changed for 3 sec., the setting is saved. This can be seen when the chosen LED’s are flashing. Machine must now be switched off, and the jumper removed from X5. Default service setting from factory is 200 hours.

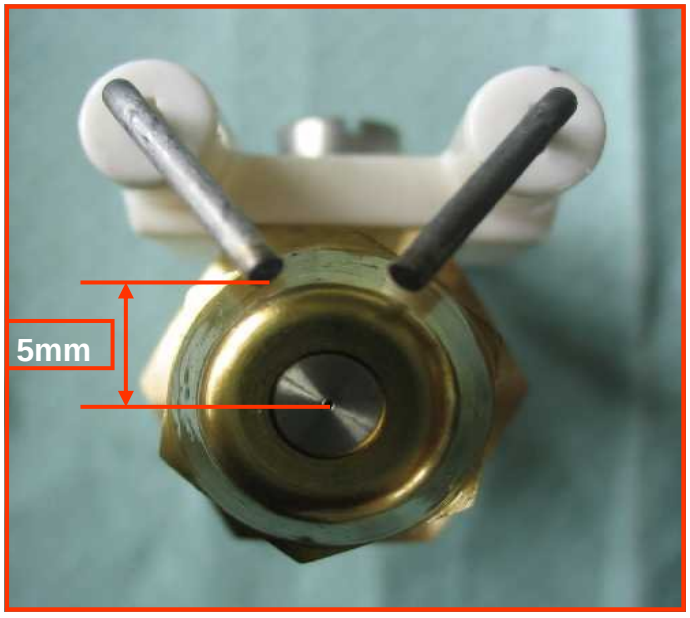


Heating system - Overview.

1. Ignition Transformer.
2. Ignition cords.
3. Ignition electrodes
4. Flame sensor.
5. Fuel nozzle.
6. Air distributer.

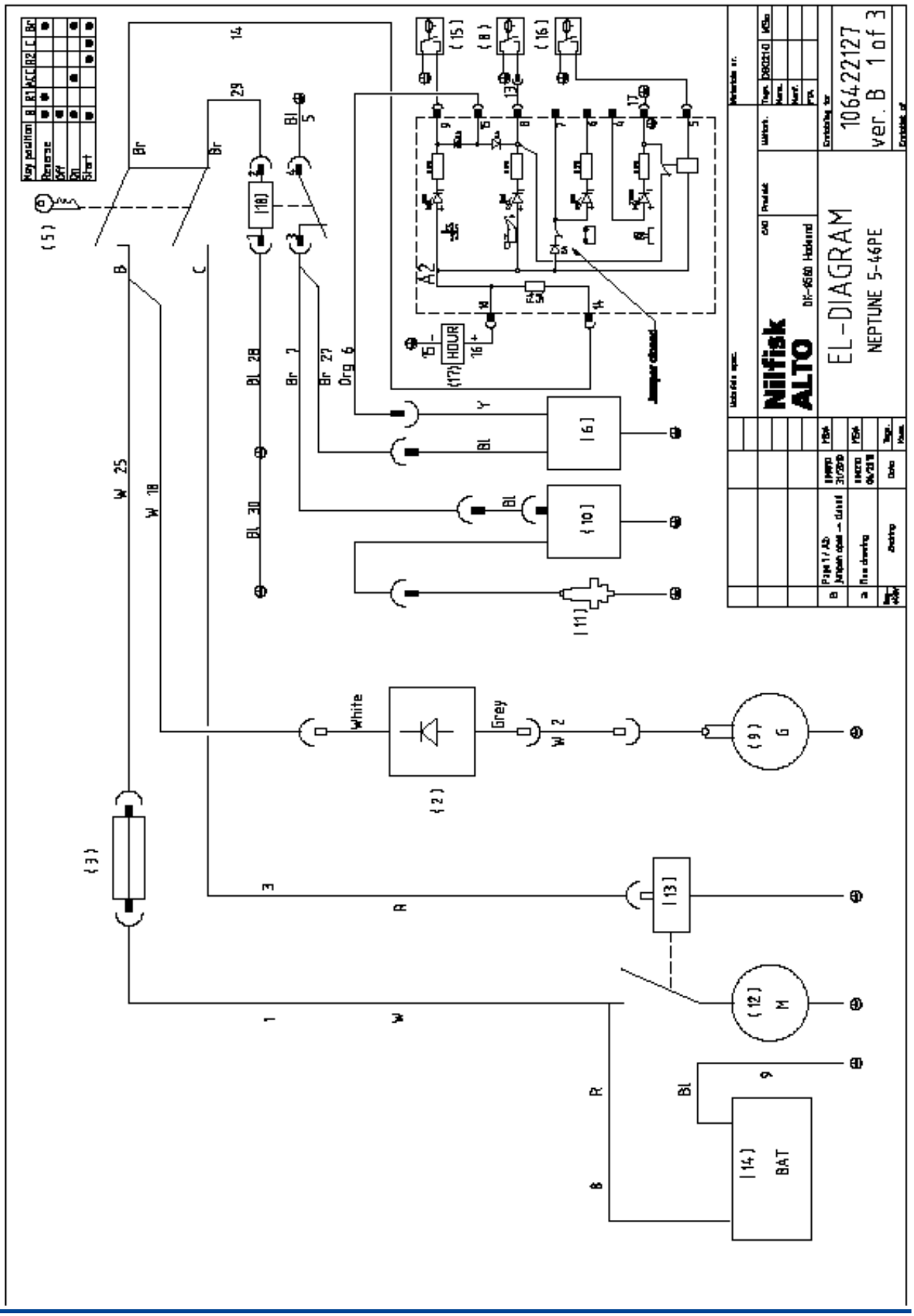


Fuel nozzle.

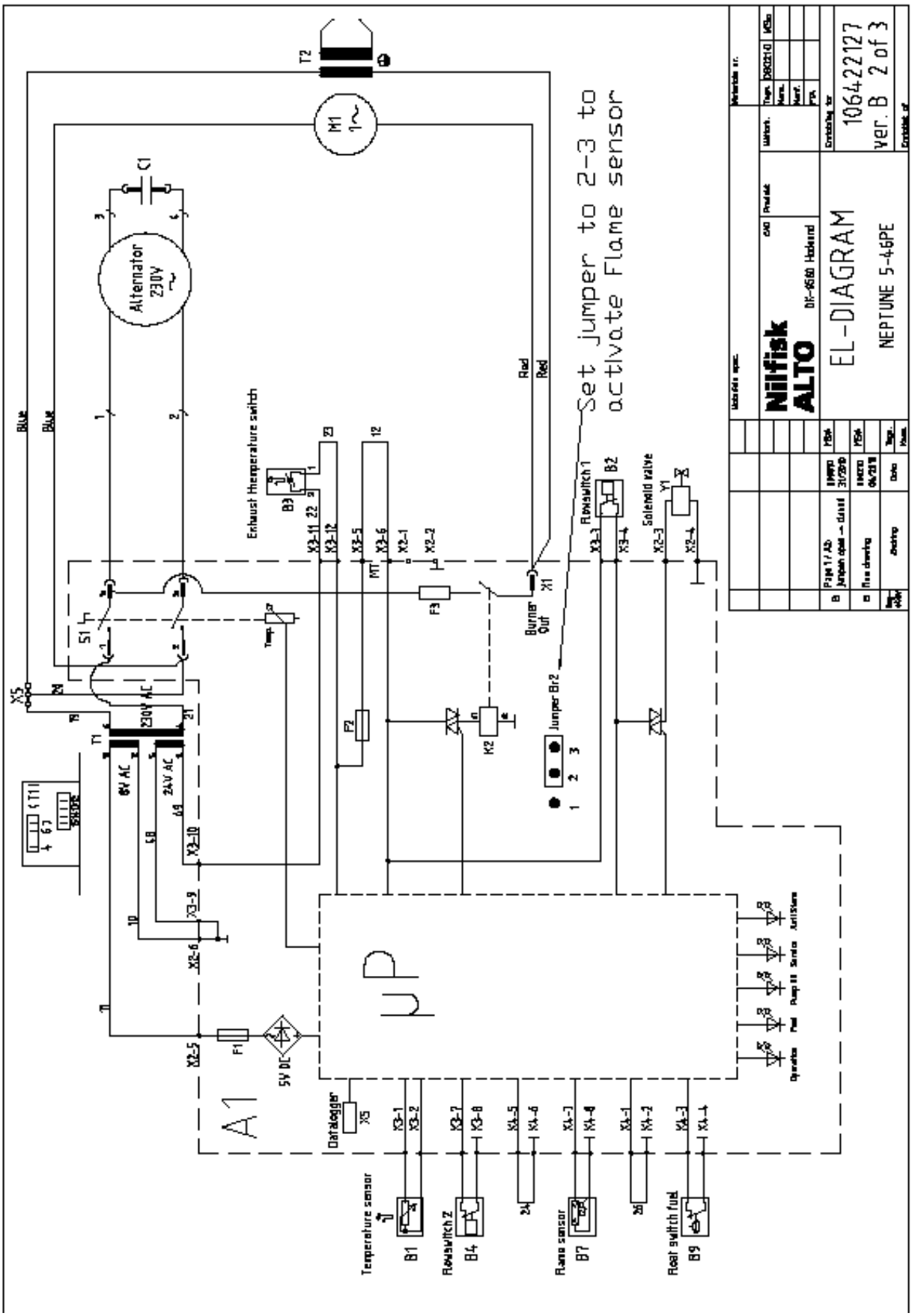


Fuel nozzle.

NEPTUNE 5-46PE 1 OF 3



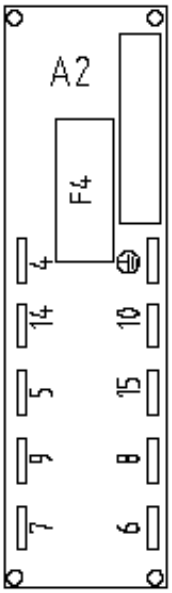
NEPTUNE 5-46PE 2 OF 3

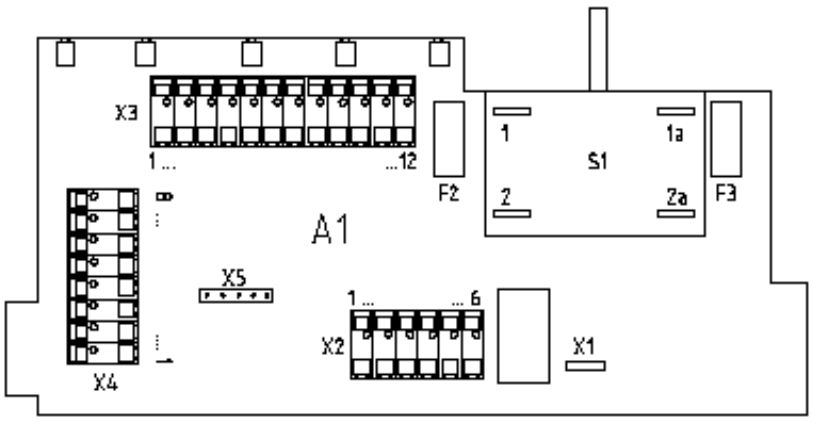


NEPTUNE 5-46PE 3 OF 3

	DANSK	ENGLISH	DEUTSCH	FRANCAIS
[2]	Ensretter	Rectifier	Gleichrichter	Redresseur
[3]	Sikring	Main fuse	Sicherung	Fusible
[4]	Regulator	Regulator	Schutzschalter	Regulateur
[5]	Tændings-kontakt	Engine switch	Zündschalter	Contacteur d'arret moteur
[6]	Olie control relæ	Oil alert unit	Öl alert-einheit	Unite dálerte d'huile
[8]	Motor olie switch	Motor oil level switch	Ölstandschalter	Contacteur de niveau d'huile
[9]	Ladespole	Charge coil	Ladespule	Bobine dé charge
[10]	Tændspole	Ignition coil	Zündspule	Bobine dállumage gauche
[11]	Tændrør	Spark plug	Zündkerze	Bougie gauche
[12]	Startmotor	Starter motor	Anlasser	Démarreur
[13]	Start relæ	Start relay	Anlassermagnetschalter	Relais
[14]	Batteri	Battery	Batterie	Batterie
[15]	Termostat pumpe	Thermostat pump	Temperatursensor pump	Fusible thermique pompe
[16]	Niveau pumpeolie	Pump oil level switch	Swimmerschalter pumpenöl	Detec. de temperateur
[17]	Timetæller	Hour meter	Stundenzäler	Compeur-heures
[18]	Stoprelæ	Relay stop	Stop schalter	Relais

A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED électronique
B1	Temperatur føler	Temperature sensor	Temperatursensor	Capteur de température
B2	Flowswitch 1	Flowswitch 2	Strömningswächter	Indicateur de débit
B3	Overhedstermostat	Safty terminal switch	Thermosicherung	Lampe a signaux, Reduit d'eau
B4	Flowswitch 2	Flowswitch 1	Strömnungswächter 1	Indicateur de débit 1
B7	Lys føler	Flame sensor	Flammsonde	Capteur de flamme
B9	Nievau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
C1	Kondensator	Capacitor	Kondensator	Condensateur
F1-F2-F3	Sikring	Fuse	Feinsicherung	Fusible fil fin
M1	Blæsermotor	Blower motor	Brennergebläsemotor	Moteur de ventilateur du brûler
S1	Drejeafbryder	Rotary switch	Drehschalter	Rotary interrupter
T1	Styretransformer	Control transformer	Steuertrafo	Transformateur
T2	Tændtransformer	Ignition transformer	Zündtrafo	Transformateur dállumage
X1-X5	Samlemuffe	Connection block	Sammelklemme	Terminal omnibus
Y1	Magnetventil olie	Solenoid valve	Magnetventil	Électrovanne





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NEPTUNE 5-46PE

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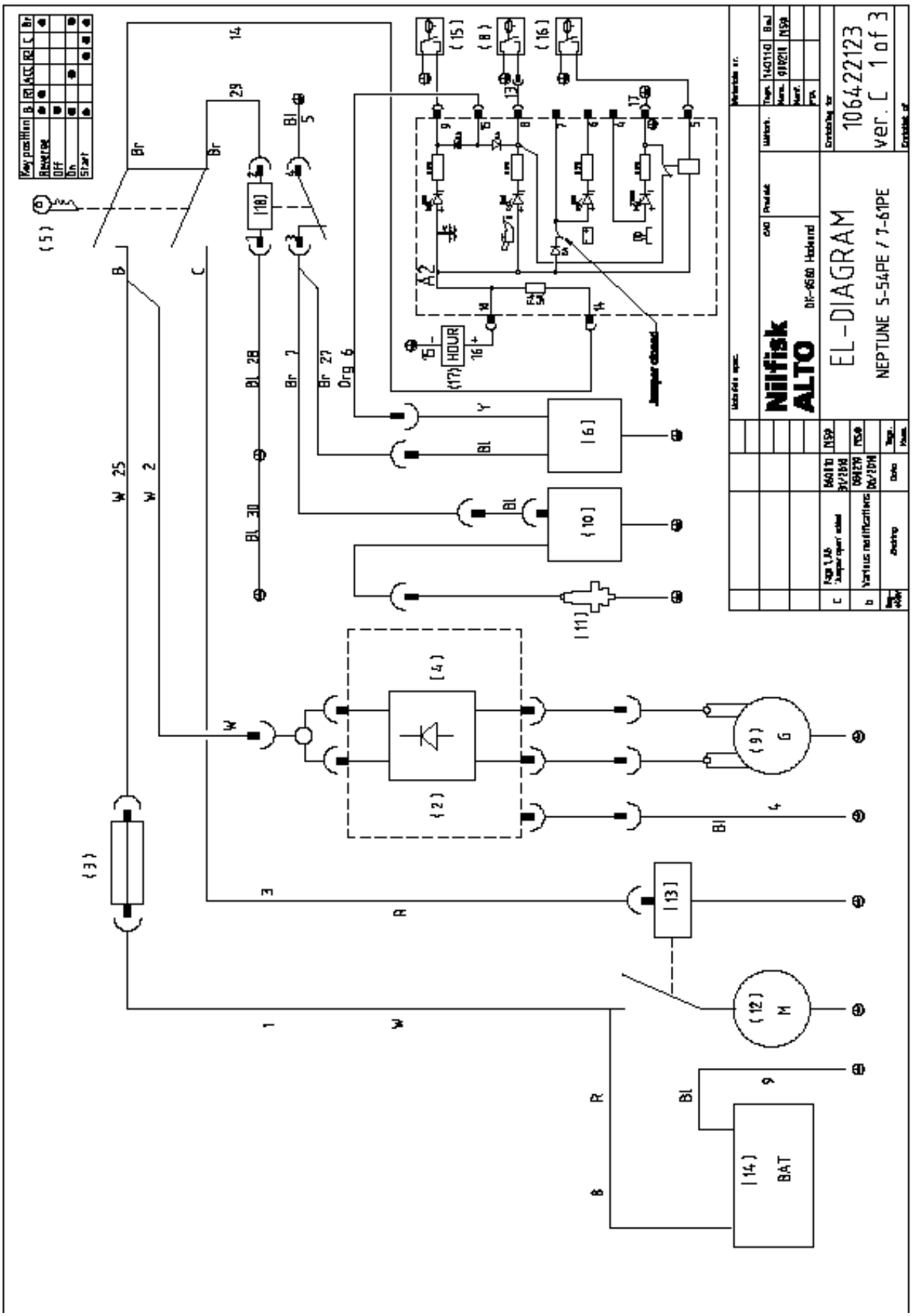
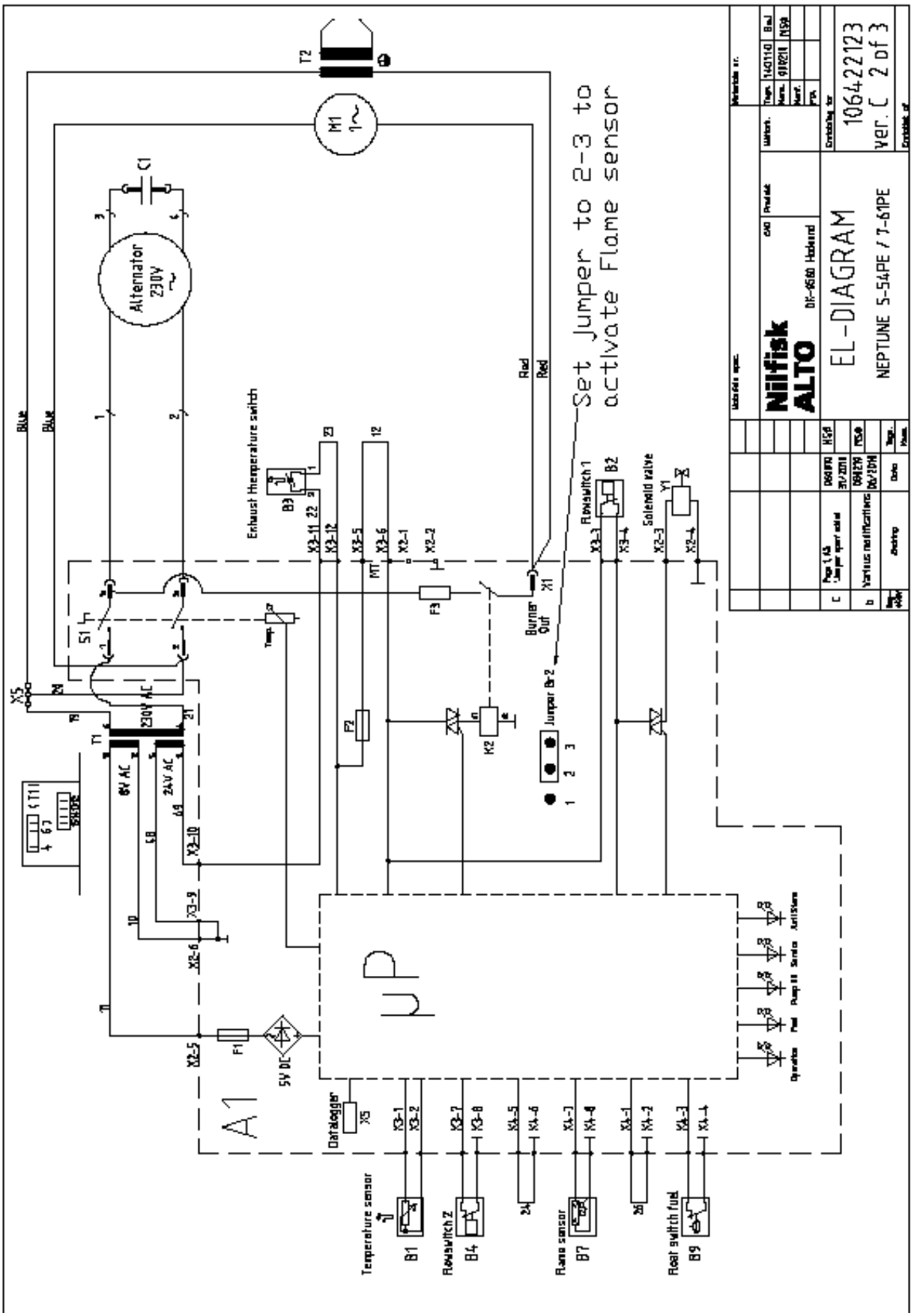
ver. B 3 of 3

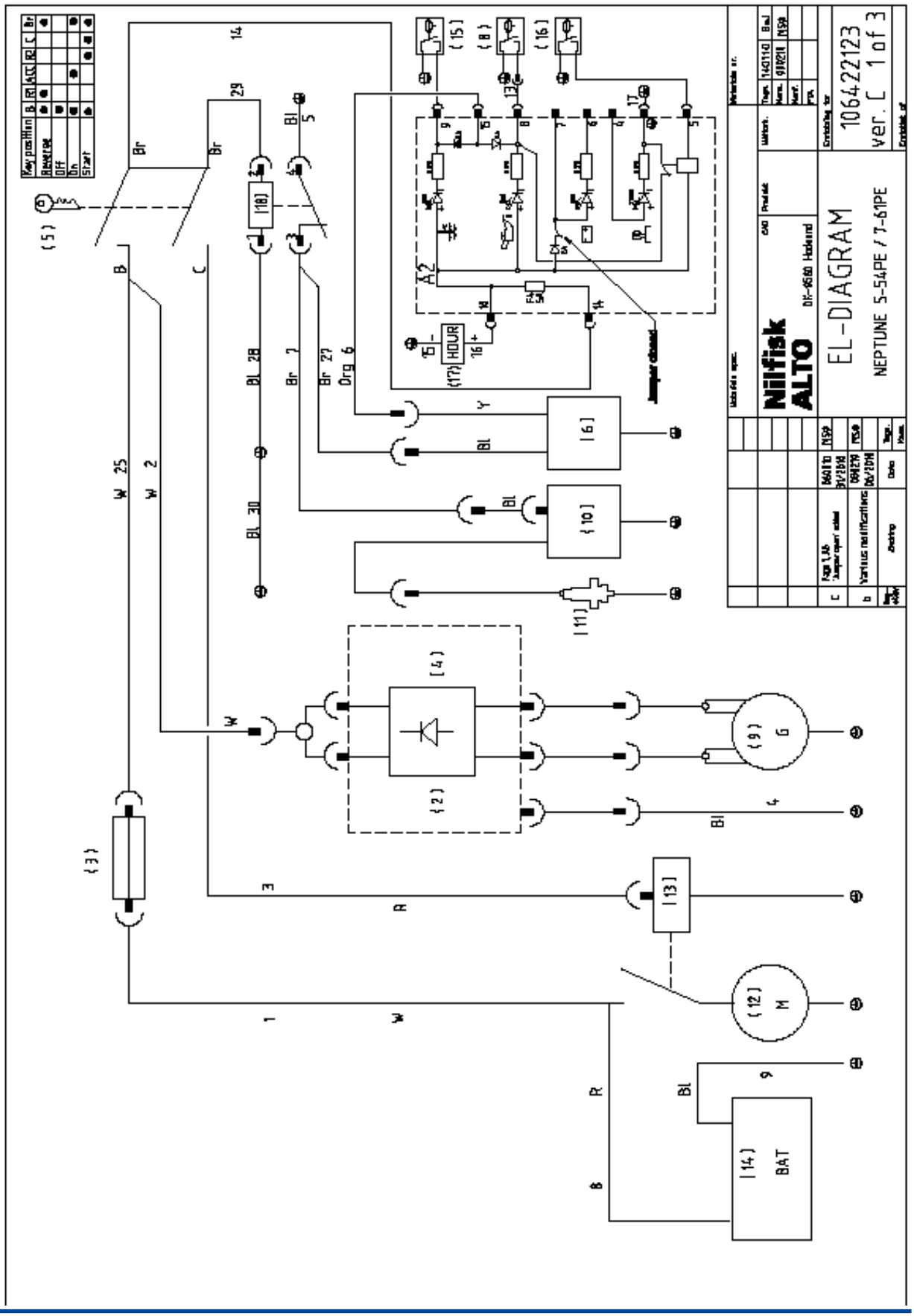
NEPTUNE 5-54 AND 7-61PE 1 OF 3



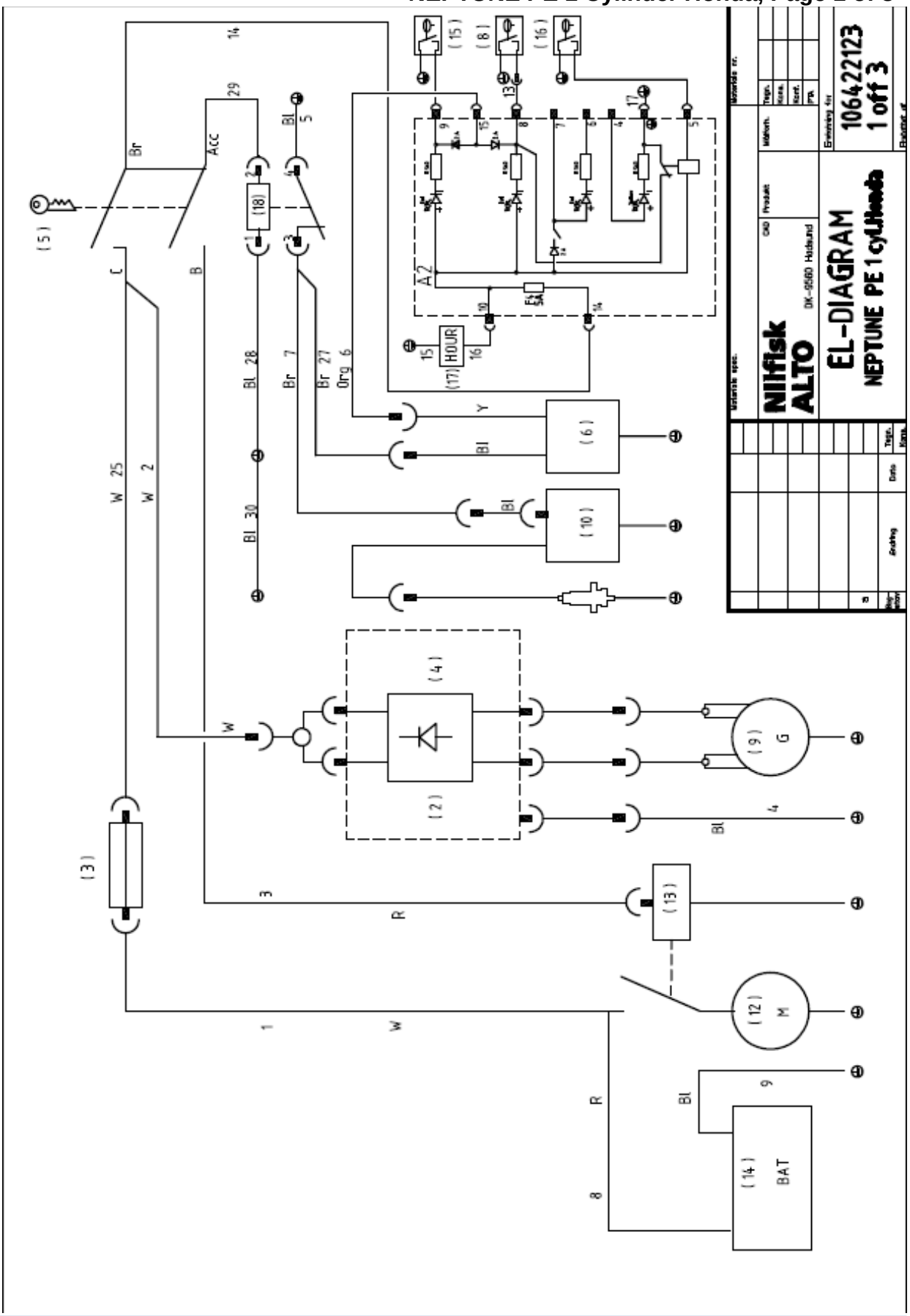
NEPTUNE 5-54 AND 7-61PE 2 OF 3



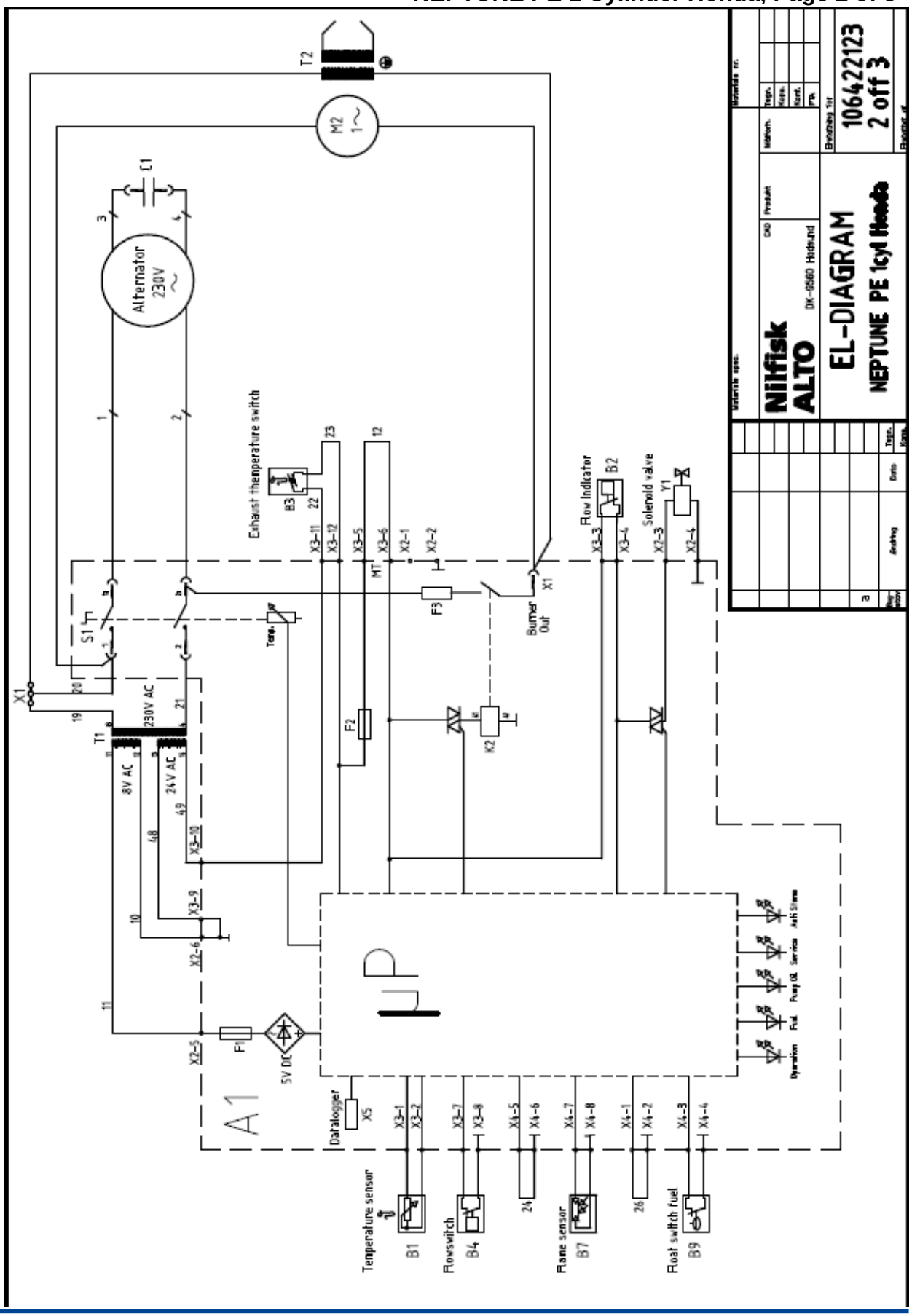
NEPTUNE 5-54 AND 7-61PE 3 OF 3



NEPTUNE PE 1 Cylinder Honda, Page 1 of 3



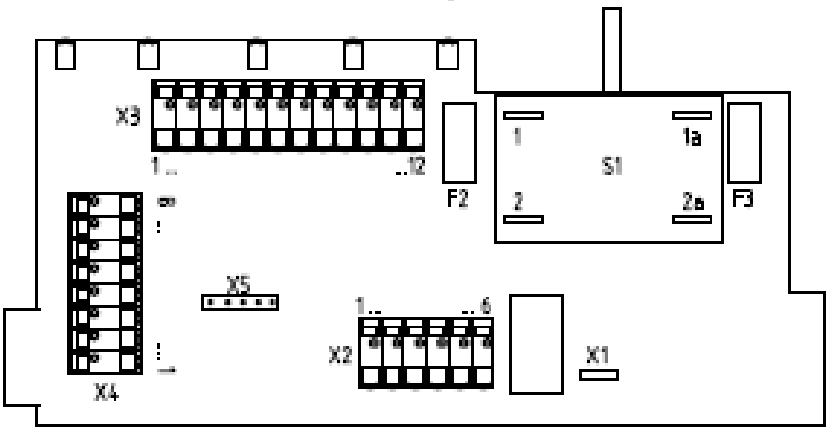
NEPTUNE PE 1 Cylinder Honda, Page 2 of 3



NEPTUNE PE 1 Cylinder Honda, Page 3 of 3

	DANSK	ENGLISH	DEUTSCH	FRANCAIS
(2)	Ensretter	Rectifier	Gleichrichter	Redresseur
(3)	Sikring	Main fuse	Sicherung	Fusible
(4)	Regulator	Regulator	Schutzschalter	Regulateur
(5)	Tændings-kontakt	Engine switch	Zündschalter	Contacteur d´arret moteur
(6)	Olie control relæ	Oil alert unit	Öl alert-einheit	Unite dálerte d´huile
(8)	Motor olie switch	Oil level switch	Ölstandschalter	Contacteur de niveau d´huile
(9)	Ladespole	Charge coil	Ladespule	Bobine dé charge
(10)	Tændspole	Ignition coil	Zündspule	Bobine dällumage gauche
(11)	Tændrør	Spark plug	Zündkerze	Bougie gauche
(12)	Startmotor	Starter motor	Anlasser	Démarreur
(13)	Start relæ	Start relay	Anlassermagnetschalter	Relais
(14)	Batteri	Battery	Batterie	Batterie
(15)	Termostat pumpe	Thermostat pump	Temperatursensor pump	Fusible thermique pompe
(16)	Niveau pumpeolie	Pump oil level switch	Swimmerschalter pumpeöl	Detec. de temperateur
(17)	Timetæller	Hour meter	Stundenzäler	Compeur-heures

A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED électronique
B1	Temperatur føler	Signallight, chemie B	Temperatursensor	Capteur de température
B8	Flowswitch 2	Flowswitch 2	Strömningswächter	Indicateur de débit
B3	Overhedstermostat	Safty terminal switch	Thermosicherung	Lampe a signaux, Reduit d'eau
B4	Flowswitch 1	Flowswitch 1	Strömningswächter 1	Indicateur de débit 1
B7	Lys føler	Flame sensor	Flammsonde	Capteur de flamme
B9	Niveau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
C1	Kondensator	Capacitor	Kondensator	Condensateur
F1-F2-F3	Sikring	Fuse	Feinsicherung	Fusible fil fin
M1	Blæsermotor	Rotary switch	Brennergebläsemotor	Moteur de ventilateur du brûler
S1	Drejeafbryder	Rotary switch	Drehschalter	Rotary interrupter
T1	Styretransformer	Control transformer	Steuertrafo	Transformateur
T2	Tændtransformer	Ignition transformer	Zündtrafo	Transformateur dällumage
X1-X2	Samlemuffe	Connection block	Sammelklemme	Terminal omnibus
Y1	Magnetventil olie	Solenoid valve	Magnetventil	Électrovanne



MATERIALE

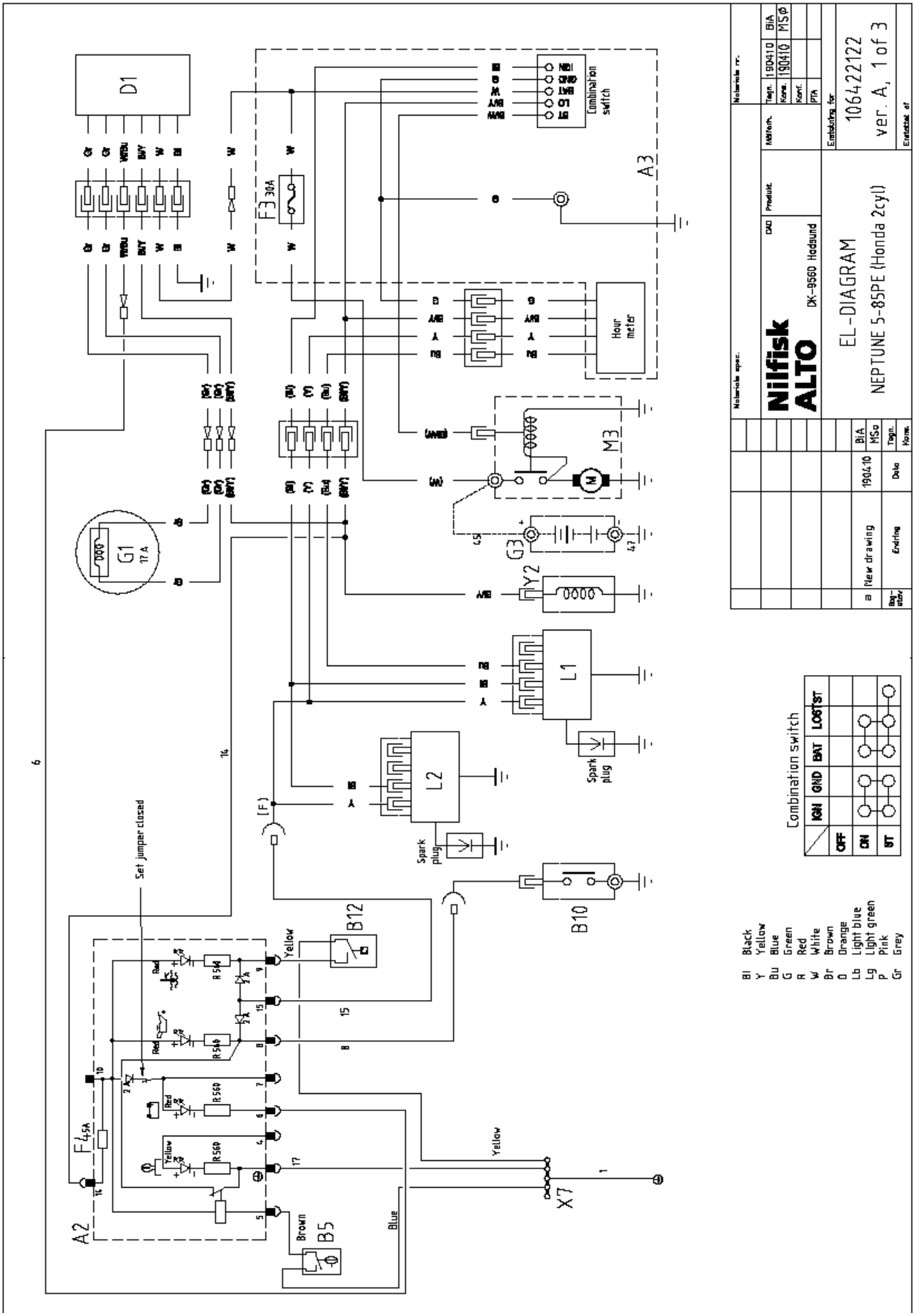
Nilfisk ALTO DK-8260 Hobro

NEPTUNE PE 1 cylinder

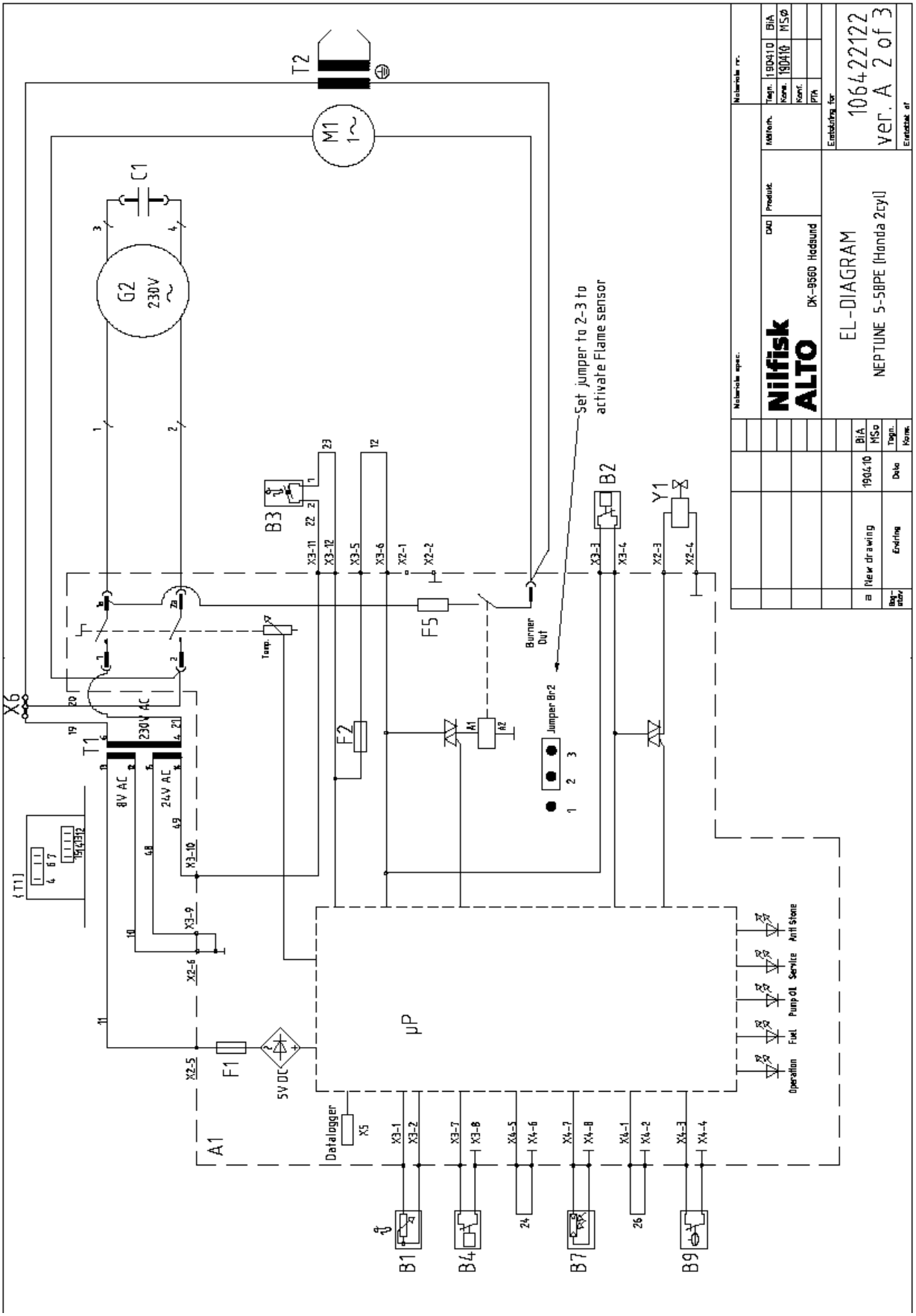
106422123

3 off 3

NEPTUNE 5-85PE 1 OF 3

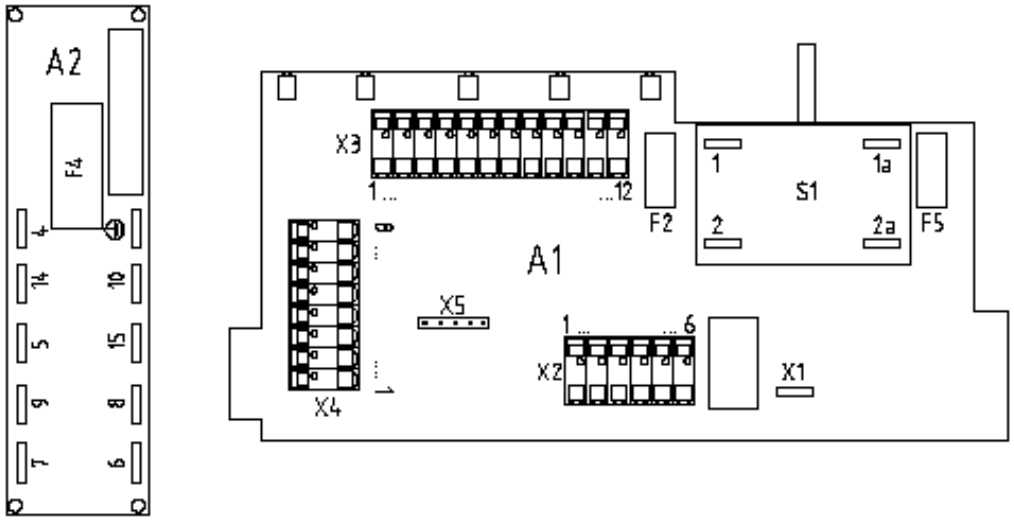


NEPTUNE 5-85PE 2 OF 3



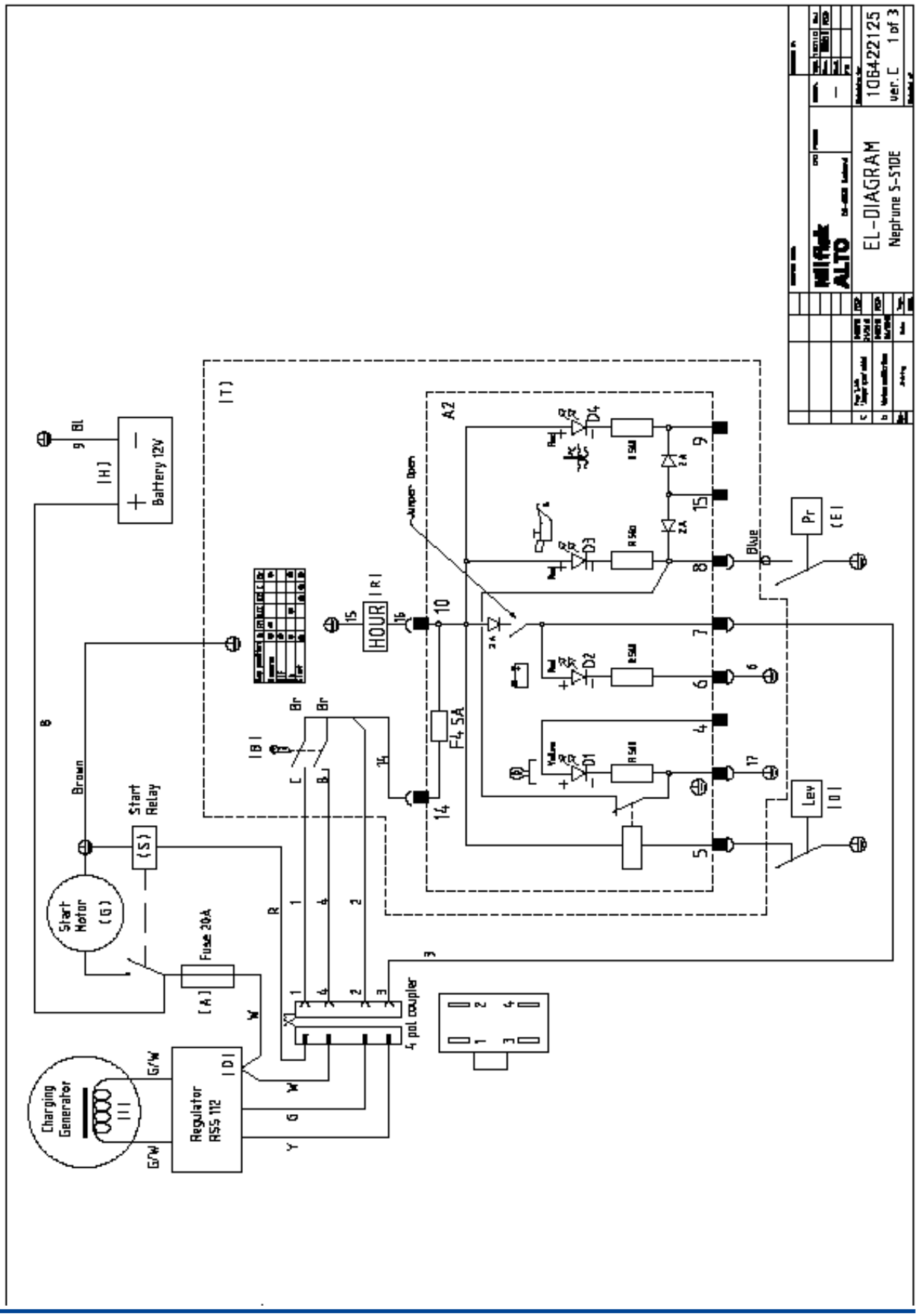
NEPTUNE 5-85PE 3 OF 3

	DANSK	ENGLISH	DEUTCH	FRANÇAIS
A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED Électronique
A3	Kontrolbox	Control box	Kontrol box	Unité de commande
B1	Temperatur føler	Temp. Sensor	Temperatur sensor	Capteur de température
B2	Flowswitch 1	Flowswitch 1	Strömungswächter 1	Indicateur de débit 1
B3	Overhedstermostat	Safety terminal switch	Thermosicherung	Lampe o signeux,
B4	Flowswitch 2	Flowswitch 2	Strömungswächter 2	Reduit d'enuindicateur de débit 2
B5	Pumpe olie switch	Pump oil switch	Pumpöl schalter	Interrupteur
B7	Flammefører	Flame sensor	Flamm sonde	Capteur de flamme
B9	Niveau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
B10	Motorolie switch	Motor oil switch	Motoröl schalter	Switch d'huile
B12	Termofører (pump)	Thermo switch (Pump)	Thermofüler (pumpl	Detec. De temperateur (pompel
C1	Kondensator	Capacitor	Kondensator	Condensateur
D1	Ensretter	Rechtifier	Gleichrichter	Redresseur
F1,F2,F5 (A1)	Sikring (print)	Fuse (el.controler)	Feinsicherung (Platine)	Fusible fil fin (commande)
F3 (A3)	Sikring (kontrolbox)	Fuse (controlbox)	Feinsicherung (kontrol box)	Fusible fil fin (Unité de commande)
F4 (A2)	Sikring (LED print)	Fuse (LED board)	Feinsicherung (Platine)	Fusible fil fin (commande)
G1	Generator 12V DC	Alternator 12V DC	Generator 12V DC	Générateur
G2	Generator 230V	Generator 230V	Generator 230V	Générateur 230V
G3	Batteri	Battery	Batteri	Batteri
L1	Tændspole	Spark coil	Zündspule	Allumage
L2	Tændspole	Spark coil	Zündspule	Allumage
M1	Motor (blæser)	Motor (fan)	Motor	Moteur
M2	Motor (diesel)	Motor (fan)	Motor (gebläsel	Moteur de ventilateur de brûler
M3	Motor (starter)	Motor (start)	Motor (Anlasser)	Moteur de démarrage
T1	Styretrafo	Control transformer	Steurtrafo	Transformateur
T2	Tændtrafo	Ignition transormer	Zündtrafo	Transformateur d'allumage
X1-X5	Klemrække	Terminal strip	Klemmen Reihe	Barette de raccordement
X6-X7	Samlemuffe	Plug	Sammeldenne	Terminal omnibus
Y1	Magnetventil olie	Magnet valve, oil	Magnet ventil	Électrovanne
Y2	Stop spole (motor)	Stop Coil (motor)	Stop Spulke (motor)	Interrupteur, pression pour moteur
IF)	Fejl input	Error input	Fehler input	Défaut, entrée

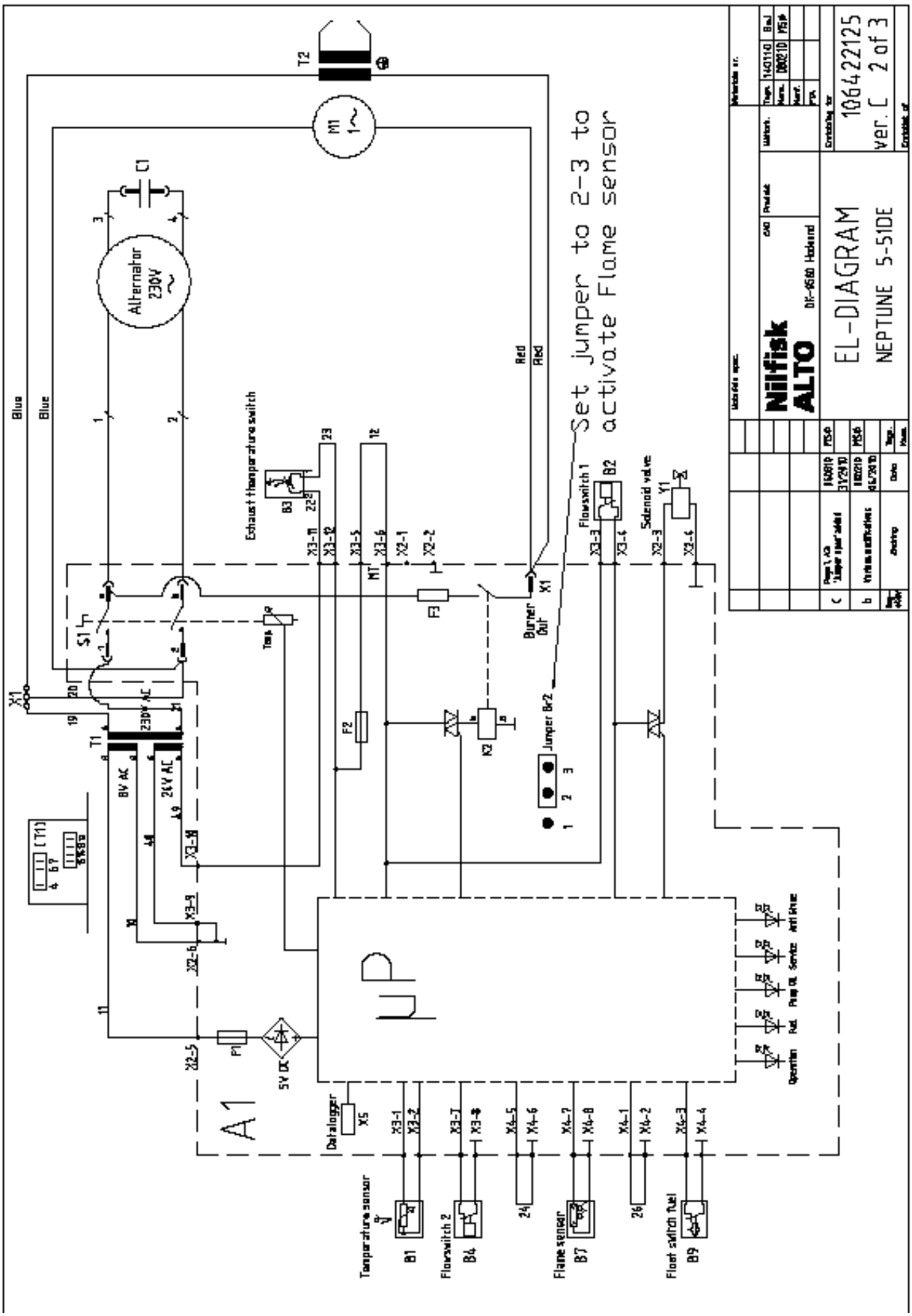


				Materiale spec.			Materiale nr.	
				Nilfisk ALTO DK-9560 Hadsund	CAD	Produkt	Måltorh.	Tegn. 190410 BIA
								Kons. 190410 MSø
								Kont.
								PTA
				EL-DIAGRAM			Erstatning for	
a	New drawing	150410	BiA MSø	NEPTUNE 5-58PE (Honda 2cyl)			106422122 ver. A 3 of 3	
Beg-stav	Ændring	Dato	Tegn. Kons.				Erstattet af	

NEPTUNE 5-51DE 1 OF 3

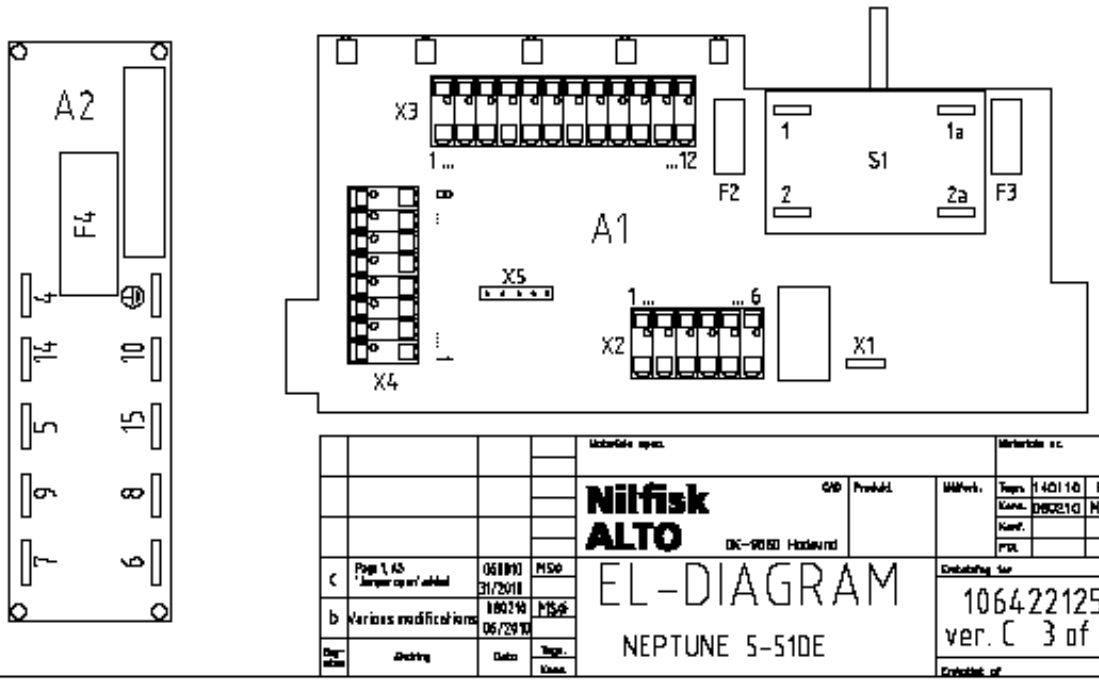


NEPTUNE 5-51DE 2 OF 3

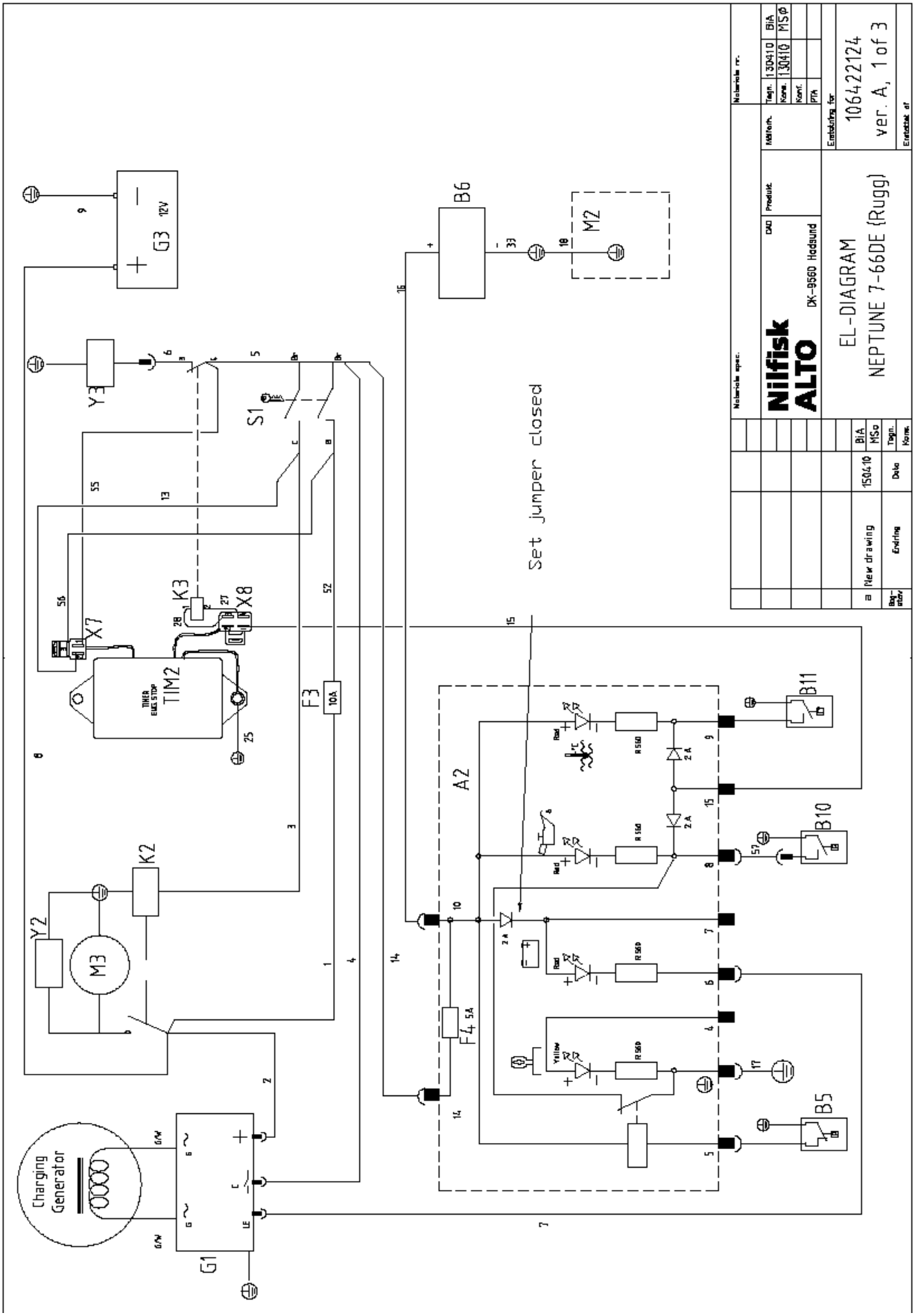


NEPTUNE 5-51DE 3 OF 3

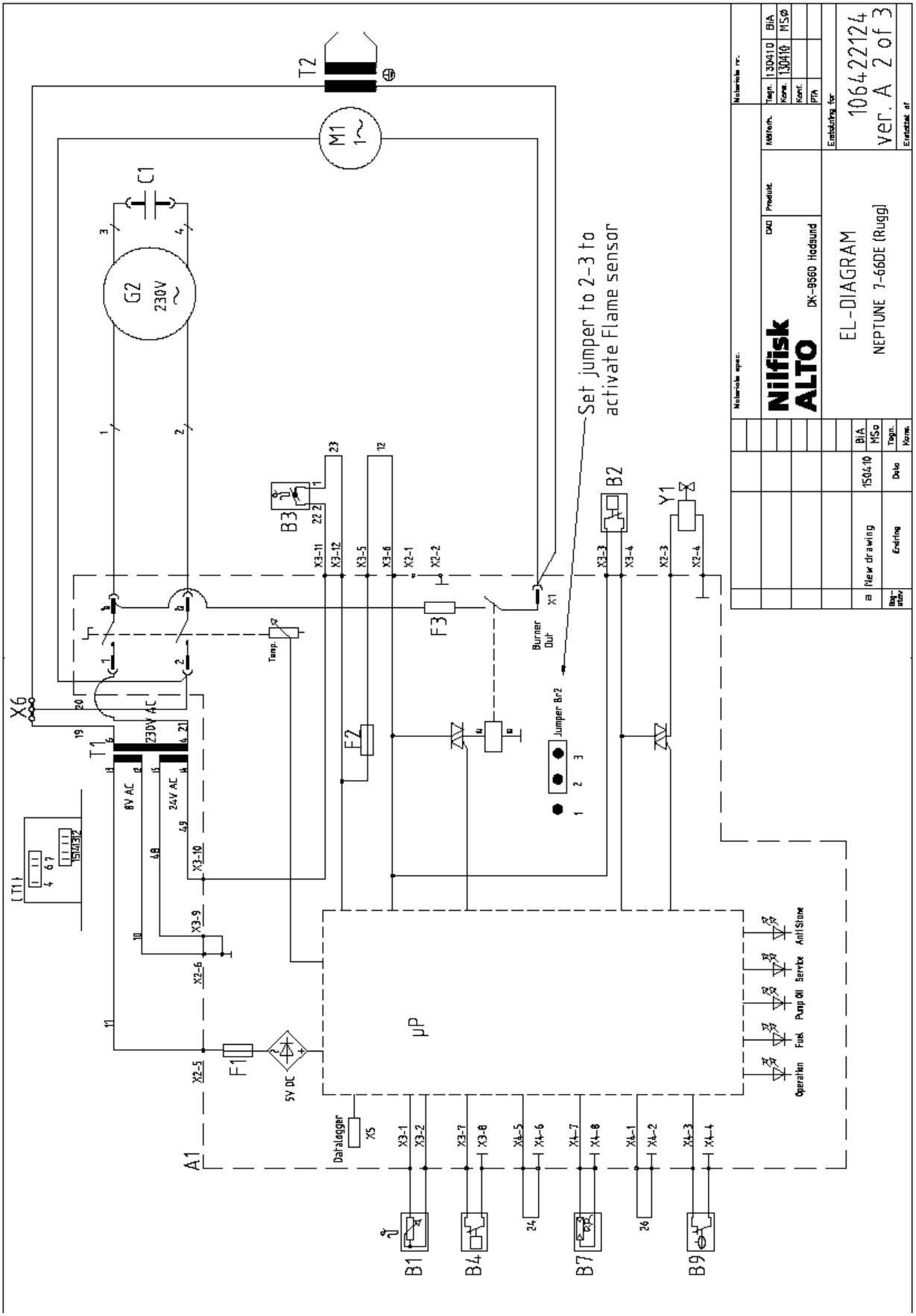
	DANSK	ENGLISH	DEUTSCH	FRANCAIS
[A]	Sikring	Main fuse	Sicherung	Fusible
[B]	Tændings-kontakt	Engine switch	Zündschalter	Contacteur d´arret moteur
[D]	Pumpe olie switch	Pump oil level switch	Pumpen Ölstandschalter	
[E]	Motor olie switch	Motor oil level switch	Motor Ölstandschalter	
[G]	Startmotor	Starter motor	Anlasser	Démarreur
[H]	Batteri	Battery	Batterie	Batterie
[I]	Ladespole	Charge coil	Ladespule	Bobine dé charge
[Q]	Regulator/ensretter	Regulator/rectifier	Schutzschalter/gleichrichter	Regulateur/redresseur
[P]	Termostat pumpe	Thermostat pump	Themperatursensor pump	Fusible thermique pompe
[Q]	Niveau pumpeolie	Pump oil level switch	Swimmerschalter pumpenöl	Detec. de temperateur
[R]	Timetæller	Hour meter	Stundenzäler	Compeur-heures
[S]	Start relæ	Start relay	Anlassermagnetschalter	Relais
[T]	Elboks	E box	Schaltkasten	
A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED électronique
B1	Temperatur føler	Temperature sensor	Temperatursensor	Capteur de température
B3	Overhedstermostat	Saffty terminal switch	Thermosicherung	Lampe a signaux, Reduit d'eau
B2	Flowswitch 1	Flowswitch 1	Strömnungswächter 1	Indicateur de débit 1
B7	Lys føler	Flame sensor	Flammsonde	Capteur de flamme
B4	Flowswitch 2	Flowswitch 2	Strömningswächter	Indicateur de débit
B9	Nievau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
C1	Kondensator	Capacitor	Kondensator	Condensateur
F1-F2-F3	Sikring	Fuse	Feinsicherung	Fusible fil fin
M1	Blæsermotor	Blower motor	Brennergebläsemotor	Moteur de ventilateur du brûler
S1	Drejeafbryder	Rotary switch	Drehschalter	Rotary interrupter
T1	Styretransformer	Control transformer	Steuertrafo	Transformateur
T2	Tændtransformer	Ignition transformer	Zündtrafo	Transformateur dällumage
X1-X5	Samlemuffe	Connection block	Sammelklemme	Terminal omnibus
Y1	Magnetventil olie	Solenoid valve	Magnetventil	Electrovanne



NEPTUNE 7-66DE 1 OF 3

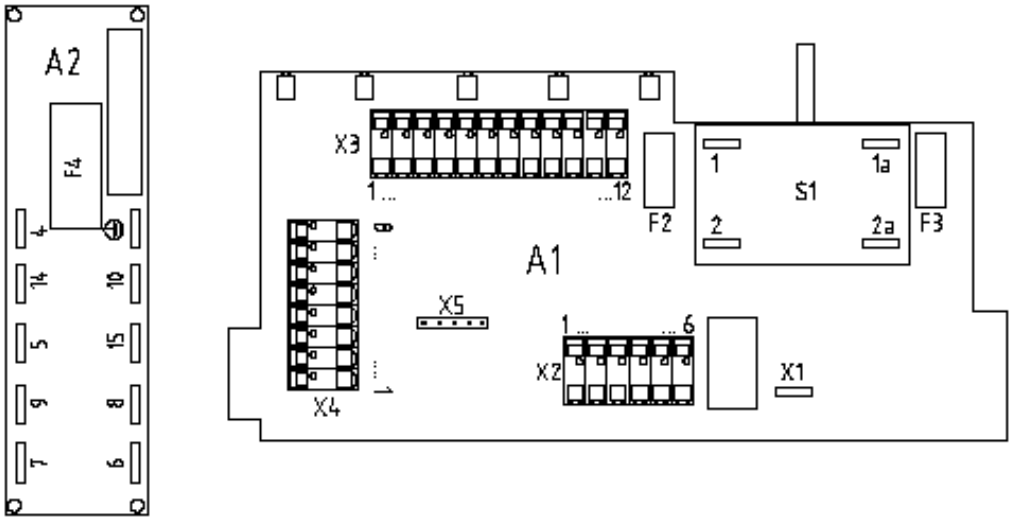


NEPTUNE 7-66DE 2 OF 3



NEPTUNE 7-66DE 3 OF 3

	DANSK	ENGLISH	DEUTCH	FRANCAIS
A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED électronique
B1	Temperatur føler	Temp. Sensor	Temperatur sensor	Capteur de température
B2	Flowswitch 1	Flowswitch 1	Strömungswächter 1	Indicateur de débit 1
B3	Overhedstermostat	Safety terminal switch	Thermosicherung	Lampe à signaux,
B4	Flowswitch 2	Flowswitch 2	Strömungswächter 2	Reduit d'eauindicateur de débit 2
B5	Pumpe olie switch	Pump oil switch	Pumpöl schalter	Interrupteur
B6	Time teller	Hour counter	Stundenzähler	Compteur électronique
B7	Flammefølger	Flame sensor	Flamm sonde	Capteur de flamme
B9	Niveau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
B10	Motorolie switch	Motor oil switch	Motoröl schalter	Swich d'huile
B11	Termoføler (motor)	Thermo switch (Motor)	Thermofüler (motor)	Detec. De temperatur (moteur)
C1	Kondensator	Capacitor	Kondensator	Condensateur
F1,F2,F5(A1)	Sikring (print)	Fuse (el.controler)	Feinsicherung (Platine)	Fusible fil fin (commande)
F3	Sikring	Fuse	Feinsicherung	Fusible fil fin
F4(A2)	Sikring (LED print)	Fuse (LED board)	Feinsicherung (Platine)	Fusible fil fin (commande)
G1	Generator 12V DC	Alternator 12V DC	Generator 12V DC	Générateur
G2	Generator 230V	Generator 230V	Generator 230V	Générateur 230V
G3	Batteri	Battery	Batteri	Batteri
K2	Start rele	Starter relay	Anlass relais	Relais de démarreur
K3	Kontaktor	Contactor	Kontaktor	Relais
M1	Motor (blæser)	Motor (fan)	Motor	Moteur
M2	Motor (diesel)	Motor (fan)	Motor (gebläse)	Moteur de ventilateur de brûler
M3	Motor (starter)	Motor (start)	Motor (Anlasser)	Moteur de démarrage
S1	Nøgle afbryder	Key switch	Schlüssel schalter	Interrupteur
T1	Styretrafo	Control transformer	Steuertrafo	Transformateur
T2	Tændtrafo	Ignition transormer	Zündtrafo	Transformateur d'allumage
Tim2	Timer (motor)	Timer eng. Stop	Relais, timer	Rupteur
X1-X6	Klemrække	Terminal strip	Klemmen Reiche	Barette de raccordement
X7-X8	Stik	Plug	Sammelklemme	Terminal omnibus
Y1	Magnetventil olie	Magnet valve, oil	Magnet ventil	Électrovanne
Y2	Stop spole (motor)	Stop Coil (motor)	Stop Spule (motor)	Interrupteur, pression pour moteur
Y3	Brændstofpumpe	Fuel pump	Brennstoffpumpe	Pompe à fuel



				Materiale spec.			Materiale nr.	
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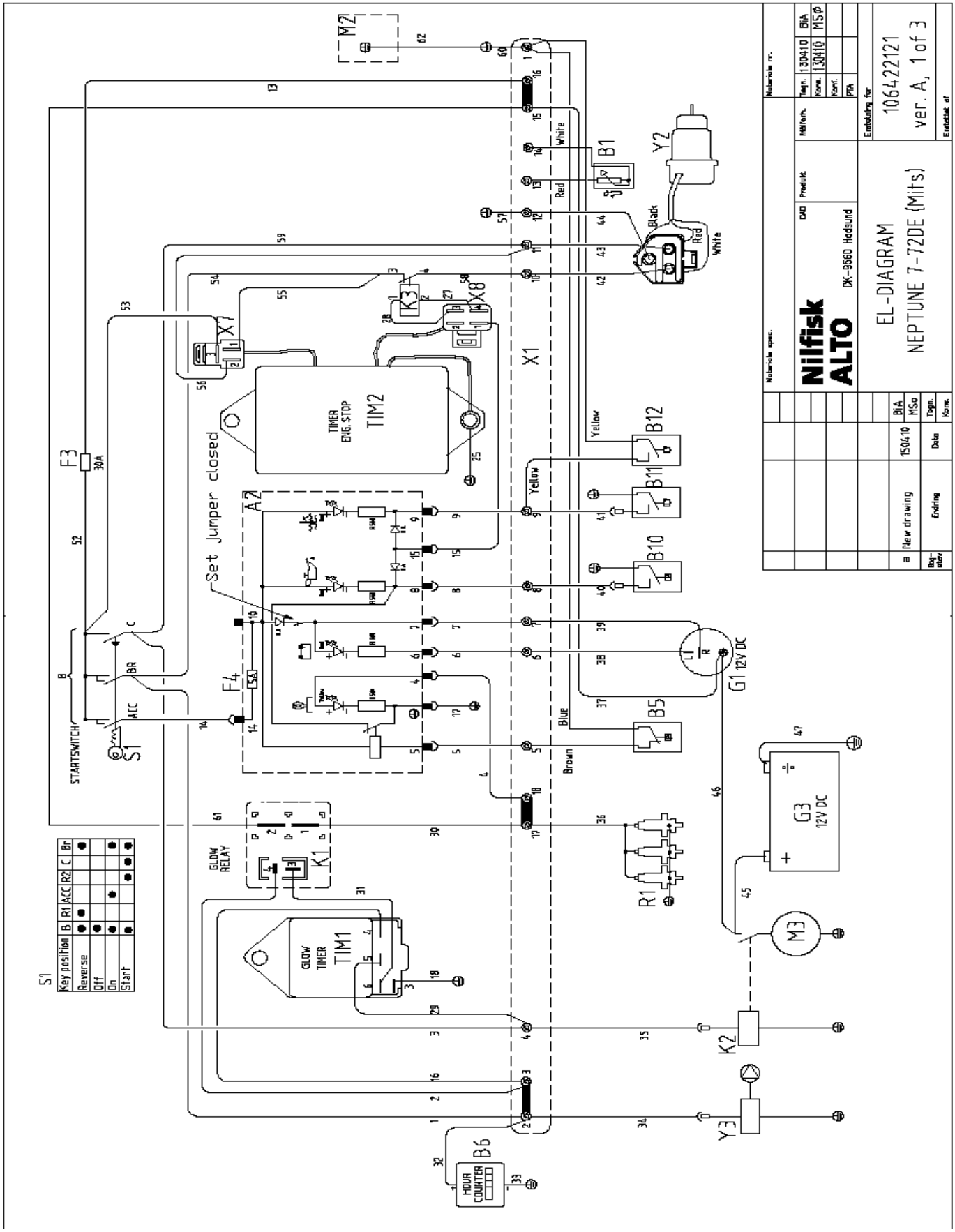
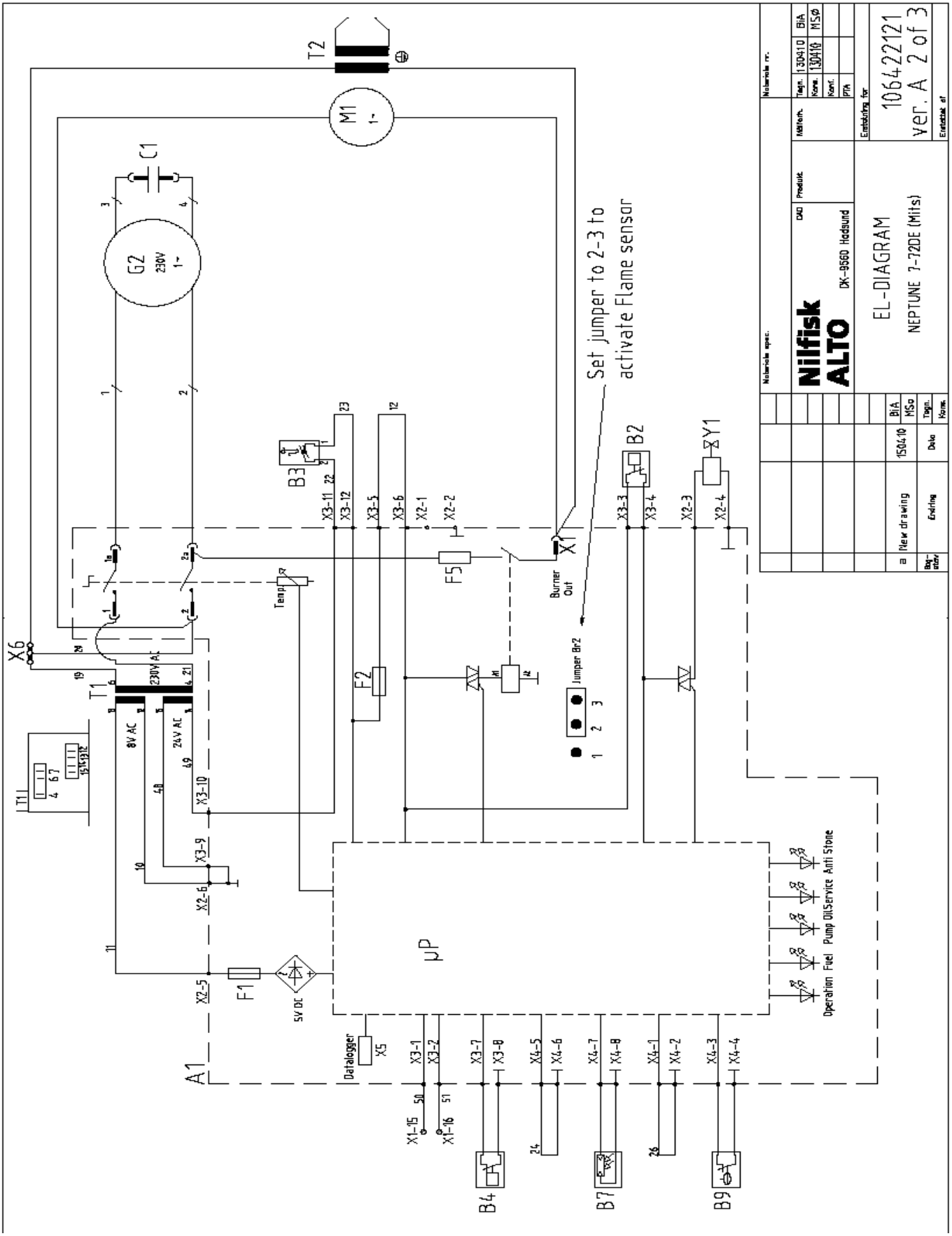
								Kons. 130410 MSø
								Kont.
								PTA
				EL-DIAGRAM			Erstatning for	
a	New drawing	150410	BiA MSø	NEPTUNE 7-66DE (Rugg)			106422124 ver. A 3 of 3	
Beg-stav	Ændring	Dato	Tegn. Kons.				Erstattet af	

NEPTUNE 7-72DE 1 OF 3

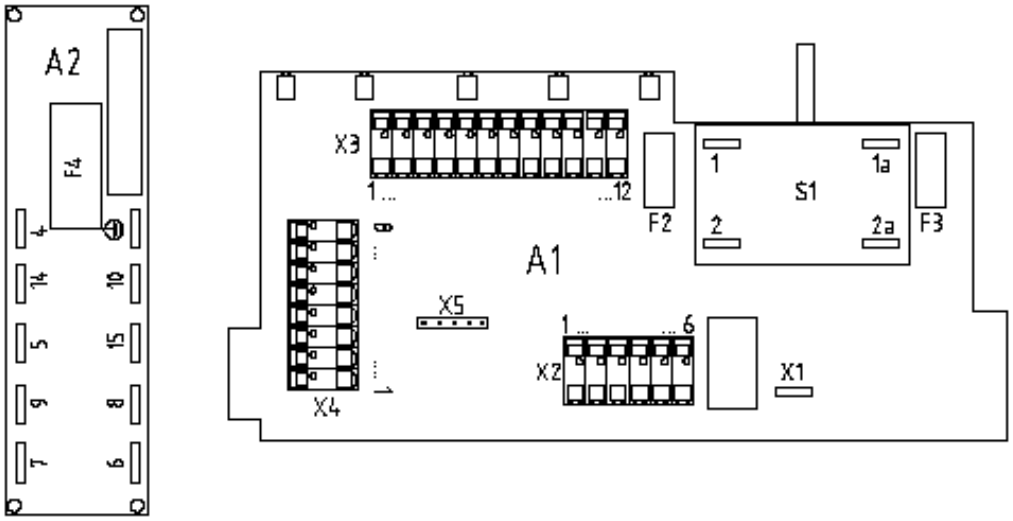


NEPTUNE 7-72DE 2 OF 3



NEPTUNE 7-72DE 3 OF 3

	DANSK	ENGLISH	DEUTCH	FRANCAIS
A1	Styreprint	Electronic controler	Steuerelektronik	Contrôleur électronique
A2	LED print	LED board	LED platine	LED électronique
B1	Temperatur føler	Temp. Sensor	Temperatur sensor	Capteur de température
B2	Flowswitch 1	Flowswitch 1	Strömungswächter 1	Indicateur de débit 1
B3	Overhedstermostat	Safety terminal switch	Thermosicherung	Lampe à signaux,
B4	Flowswitch 2	Flowswitch 2	Strömungswächter 2	Reduit d'eauindicateur de débit 2
B5	Pumpe olie switch	Pump oil switch	Pumpöl schalter	Interrupteur
B6	Time teller	Hour counter	Stundenzähler	Compteur électronique
B7	Flammefføler	Flame sensor	Flamm sonde	Capteur de flamme
B9	Niveau diesel	Level switch fuel	Schwimmerschalter brennstoff	Automate à flotteur combustible
B10	Motorolie switch	Motor oil switch	Motoröl schalter	Swich d'huile
B11	Termoføler (motor)	Thermo switch (Motor)	Thermofüler (motor)	Detec. De temperateur (moteur)
B12	Termoføler (pump)	Thermo switch (Pump)	Thermofüler (pumpl	Detec. De temperateur (pompe)
C1	Kondensator	Capacitor	Kondensator	Condensateur
F1,F2,F5(A1)	Sikring (print)	Fuse (el.controler)	Feinsicherung (Platine)	Fusible fil fin (commande)
F3	Sikring	Fuse	Feinsicherung	Fusible fil fin
F4(A2)	Sikring (LED print)	Fuse (LED board)	Feinsicherung (Platine)	Fusible fil fin (commande)
G1	Generator 12V DC	Alternator 12V DC	Generator 12V DC	Générateur
G2	Generator 230V	Generator 230V	Generator 230V	Générateur 230V
G3	Batteri	Battery	Batterl	Batteri
K1	Glöde relæ	Glow relay	Glühen relais	Relais de chauffage
K2	Start relæ	Starter relay	Anlass relais	Relais de démarreur
K3	Kontaktor	Contactor	Kontaktor	Relais
M1	Motor (blæser)	Motor (fan)	Motor	Moteur
M2	Motor (diesel)	Motor (fan)	Motor (gebläsel	Moteur de ventilateur de brûler
M3	Motor (starter)	Motor (start)	Motor (Anlasser)	Moteur de démarrage
R1	Glöde rör	Glow plug	Glühkerze	Bougie
S1	Nøgle afbryder	Key switch	Schlüssel schalter	Interrupteur
T1	Styretrafo	Control transformer	Steurtrafo	Transformateur
T2	Tændtrafo	Ignition transormer	Zündtrafo	Transformateur d'allumage
Tim1	Timer (glöde)	Glow timer	Timer	Rupteur
Tim2	Timer (motor)	Timer eng. Stop	Relais, timer	Rupteur
X1-X6	Klemrække	Terminal strip	Klemmen Reiche	Barette de raccordement
X7-X8	Stik	Plug	Sammelklemme	Terminal omnibus
Y1	Magnetventil olie	Magnet valve, oil	Magnet ventil	Électrovanne
Y2	Stop spole (motor)	Stop Coil (motor)	Stop Spule (motor)	Interrupteur, pression pour moteur
Y3	Brændstofpumpe	Fuel pump	Brennstoffpumpe	Pompe à fuel



				Materiale spec.			Materiale nr.	
				Nilfisk ALTO DK-9560 Hadsund	CAD	Produkt	Måltegn.	Tegn. 130410 BIA
								Kons. 130410 MSø
								Konf.
								PTA
				EL-DIAGRAM			Erstatning for	
a	New drawing	150410	BiA MSø	NEPTUNE 7-72DE (Mits)			106422121 ver. A 3 of 3	
Beg-stav	Ændring	Dato	Tegn. Kons.				Erstattet af	

Notes

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